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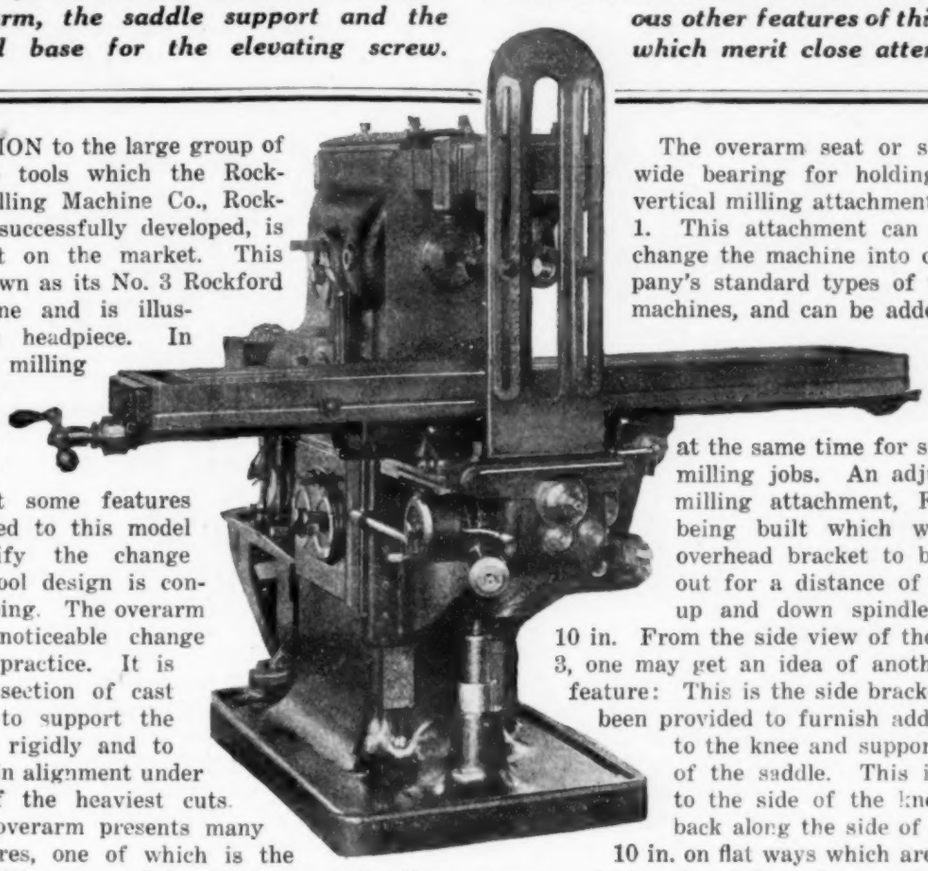
Rockford Number Three Milling Machine

By J. V. HUNTER
Western Editor, *American Machinist*

The points of this machine which will first catch the eye of the reader, are the rectangular overarm, the saddle support and the reinforced base for the elevating screw. However, careful inspection of the text and illustrations of this article will reveal numerous other features of this machine which merit close attention.



AN ADDITION to the large group of machine tools which the Rockford Milling Machine Co., Rockford, Ill., has successfully developed, is now being put on the market. This machine is known as its No. 3 Rockford Milling Machine and is illustrated in the headpiece. In general, the milling machine is thought to be fairly well standardized in design, but some features have been added to this model which exemplify the change that machine-tool design is constantly undergoing. The overarm is the most noticeable change from common practice. It is a rectangular section of cast iron designed to support the arbor brackets rigidly and to keep the arbor in alignment under the stresses of the heaviest cuts. This form of overarm presents many desirable features, one of which is the possibility of setting up work by measuring or leveling up from its broad lower surface with a precision practically equal to working direct from the surface of the table. The mechanic will find this especially serviceable when it is difficult to measure the height of inside portions of the work with a surface gage used in the ordinary way.

The overarm seat or slide provides a wide bearing for holding in place the vertical milling attachment shown in Fig. 1. This attachment can be supplied to change the machine into one of the company's standard types of vertical milling machines, and can be added at any time. With this device in place it is possible to use two cutters at the same time for side and vertical milling jobs. An adjustable vertical milling attachment, Fig. 2, is also being built which will permit the overhead bracket to be moved in or out for a distance of 16 in., and an up and down spindle movement of 10 in. From the side view of the machine, Fig. 3, one may get an idea of another outstanding feature: This is the side bracket *A* which has been provided to furnish additional rigidity to the knee and support the overhang of the saddle. This is fitted solidly to the side of the knee and extends back along the side of the column for 10 in. on flat ways which are provided with T-slots and clamping bolts. Its use is optional with the operator and depends upon the character of the work.

The boss or base bracket, holding the nut for the elevating screw, is connected to the column, as shown at *B*. This heavy added section aids in resisting the down thrust of the elevating screw and adds to the

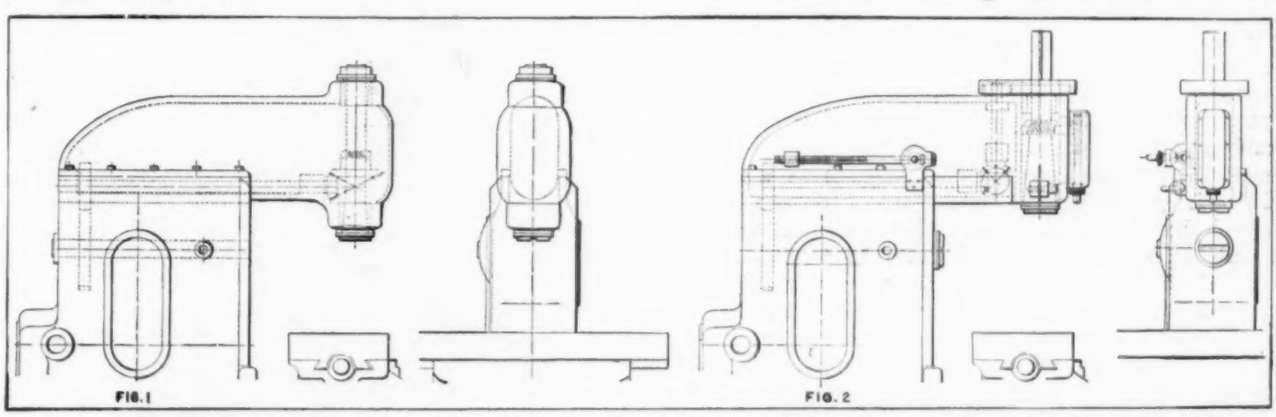


FIG. 1. STATIONARY VERTICAL MILLING ATTACHMENT. FIG. 2. VERTICAL ATTACHMENT WITH HORIZONTAL AND VERTICAL ADJUSTMENT

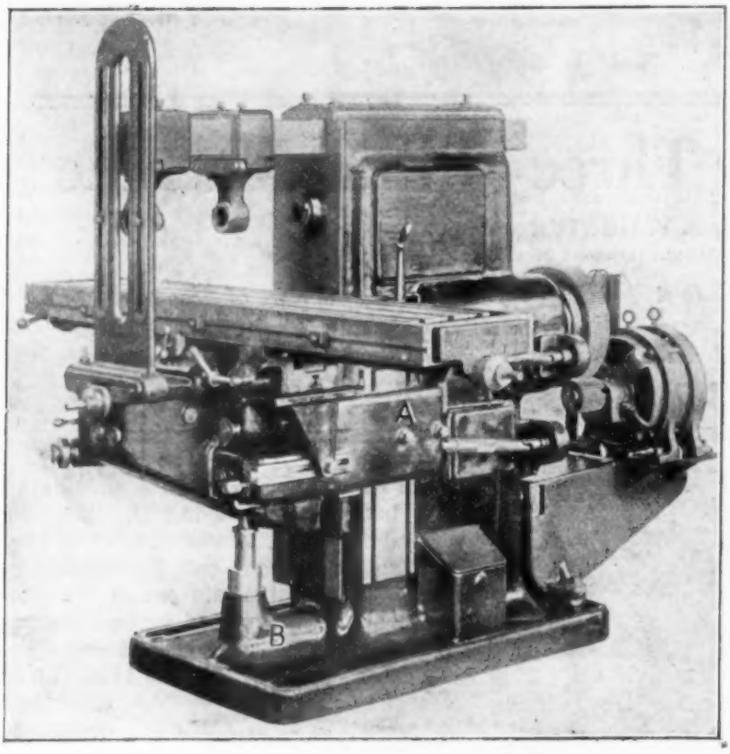


FIG. 3. RIGHT-HAND SIDE OF MACHINE

rigidity of the knee. It also adds greatly to the ease of obtaining fine adjustments, since the base web is not so apt to spring downward under its load.

The gearing is designed so that all shafts are supported by bearings on the outside of the gears, thus avoiding the necessity of carrying any of these on outboard ends or studs. All drive shafts are carried on high-duty roller bearings oiled by forced lubrication from a geared oil pump. This pump draws its supply from a reservoir in the base and floods it down from inside the top of the machine over all bearings. The column is built as an oil-tight case and has two reservoirs in its base, one for the lubricating oil and the other for the coolant. The speed changes of the machine are controlled from the side of the column, Fig. 4. The gear tumbler bracket is not shifted endwise but is merely rocked up and down, as the different speeds desired are selected by the other controls. Two intermediate gears are shifted endwise by the plug lever to correspond with speed gears on the tumbler, and in this the operator is guided by the speed diagram fastened to the column of the machine above this lever. The lower or selective gear lever is kept in neutral position while the others are being adjusted and it is then moved around until it reaches a positive stop. This fixes its position as it is entirely selective in its action. Eighteen speed changes, in geometric progression, are available, ranging in speed from 15 to 360 r.p.m. The reverse lever is conveniently located on the side of the column and serves to reverse the spindle rotation at all speeds.

The crossfeed screw for the saddle is located in the center of the top of the knee. This eliminates any tendency of the saddle to twist or bind on the ways. Both this and the table and vertical screws are provided with large ball-thrust bearings.

The compact feed box gives a range of fourteen feeds varying from ½ to 16 in. per minute. The feed changes are controlled somewhat similar to those for speed, using two shifting levers and a selective tumbler. The feed reverse lever is conveniently located on the side of the knee and it will reverse the feed of either the table, the saddle or the knee, whichever may happen to be in operation. All gears and shafts are made of hardened and heat-treated special steel.

The feeds in either direction are automatic and are controlled by a feed-trip mechanism which is positive in its action. This trip mechanism is very sensitive, its quick action being obtained by connecting a high-speed clutch to the gear-feed mechanism where the ratio is four to one, instead of tripping with a clutch directly connected to the feed screw. The big advantage is that when working with very slow feeds the operator need not wait so long for the teeth of the drive mechanism to line up in order to throw them into mesh.

The table has a quick-return mechanism which can be operated in either direction, and is controlled by a lever on each side of the saddle.

An oil-tight pocket is provided in the middle of the saddle in which the gearing is located. Oil is put into this pocket to a height slightly above the bottom of the table screw. This permits both the gearing and the screw to run in a constant bath of oil and insures full lubrication of these parts. The oil bath is supplied through a duct extending to the outside of the table where it is handy for the operator.

The spindle is of a special grade of hammered steel, ground to size, and runs in adjustable bronze bearings. The spindle nose is provided with keys for driving face-mills which are held in place by a draw-in rod that passes through the spindle. These keys can also be used for driving a flanged arbor with keyways cut in the face of the flange.

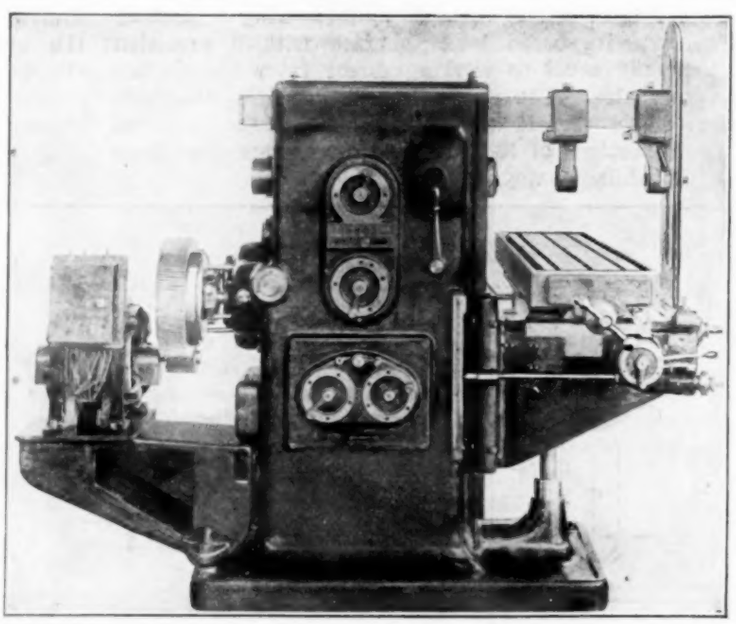


FIG. 4. SIDE VIEW SHOWING SPEED AND FEED CONTROLS

As has been stated, a reservoir has been provided in the base of the column for the coolant. The filling spout *A*, Fig. 5, is so constructed that chips and sediment may be removed from the bottom of the reservoir.

The power drive is through a friction clutch located on the main drive shaft at the rear of the machine. This is operated by convenient levers located on both sides of the column. When built for belt drive the outside ring of this clutch constitutes the belt pulley. For motor drive the motor is mounted on a heavy cast-iron bracket bolted to the rear of the column. A fabroil pinion on the motor shaft meshes direct with teeth cut in the main clutch ring.

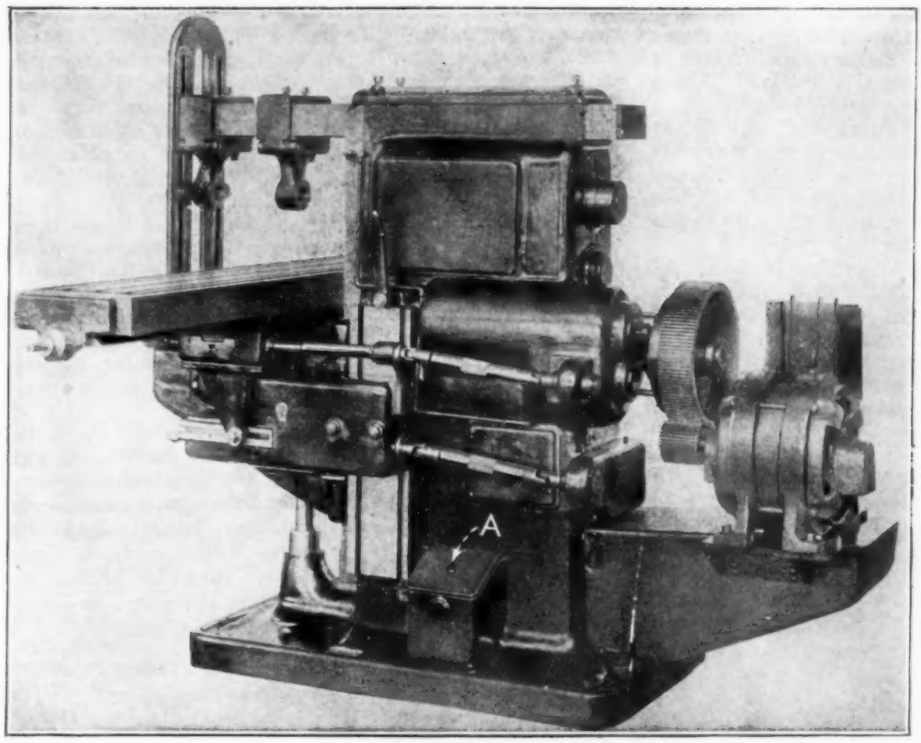


FIG. 5. REAR OF MACHINE WITH DIRECT-CONNECTED MOTOR

Specifications: Table feed automatic, 34 in.; crossfeed automatic 12 in.; vertical feed, automatic, 20⅞ in.; working surface of table, 15 x 52 in.; overarm, 4½ x 9½ in.; number of arbor supports, 2; center of spindle to bottom of overarm, 7½ in.; B. & S. taper hole, No. 11; hole through spindle, ⅞ in.; index center swing, 12 in.; index centers take in length, 40 in.; three-jaw universal chuck, 9 in.; width of vise jaws, 7½ in.; depth of vise jaws, 2½ in.; vise opens with steel jaws, 6 in.; number of speed changes, 18; range of speed (r.p.m.), 15 to 360; number of feed changes, 14; range of feed (in inches per minute), ½ to 16; diameter of driving pulley, 16 in.; width of belt, 4 in.; speed of driving pulley (r.p.m.), 320; horsepower of electric motor, 10; net weight (in pounds) approximate, 7,200.

Finding the Age of Machine Tools

BY L. L. THWING

It sometimes happens that there is a dispute in the shop about the age of a machine that has stood on the floor so long that the date of its installation is a matter of tradition, rather than history. If the machine has a serial number, the question generally may be easily settled, but machines twenty years old do not always have serial numbers, in which case the only recourse is an examination of the machine for certain features of design that were standard with its maker between certain dates. Anyone having a complete file of the catalogs of this particular manufacturer can readily settle these questions, provided catalogs are dated, but few appear to have been interested enough to save them. One other source of information is the files of the *American Machinist*.

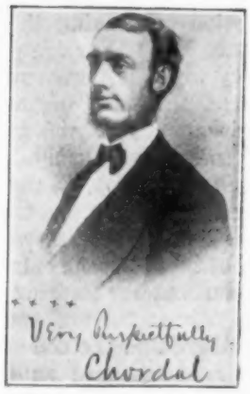
In an attempt to settle a question concerning the age of machine tools with gear boxes, the writer spent an interesting afternoon in a library which is fortunate enough to have files of the *American Machinist* beginning with Vol. 6 (1883). The advertising as well as the editorial sections are retained in the older volumes though at that time the advertising columns were not as extensive as they are today and included three-fourths of the last page only. The first use of any improvement is sure to be local and unadvertised, and the use of gear boxes may have antedated 1891, but this is the date of the first advertising of this device. The first gear boxes were not part of an all-geared feed, but were driven by belt.

The Garvin Machine Co. advertised in 1890 its No. 3 milling machine as having twenty-four feeds for each spindle speed. This was accomplished through loose change gears, but it indicates the demand for greater flexibility of feeds. In 1891 Flather & Co. advertised a new model lathe having a three-speed, slip-key, belt-driven gear box, and, with New England honesty said, "We are aware that this device has been used before." In the same year the Gisholt turret lathe appeared with a four-speed gear box.

The first all-geared feed with gear box the writer has been able to find, was on the 1893 model of the Hendey-Norton lathe and is apparently the same as is furnished today on that make of lathe. It is not improbable that some one may be able to furnish further information on this subject, but the above information settled the particular question involved, and may not be uninteresting to others.

It may not be out of place to mention that gear boxes and other improvements were introduced ten to twenty years before they came into general use. Double back gears for engine lathes were advertised by Prentice Bros. as early as 1891, but it is only recently that they have become at all common. Helical gears are slowly finding an accepted place in machine-tool design, but the writer recalls seeing in a small machine shop in Brockton, Mass., an engine lathe probably thirty years old with back gears of this kind. This suggests that the determination of the age of a machine by its design resolves itself into an investigation of the available records of the particular manufacturer who made the machine.

[The author must have gotten hold of an 1883 volume of the *American Machinist*, in which all the advertising pages were not included in the binding. The advertisements of that year covered almost seven pages.—EDITOR.]



JAMES WARING SEE died at his residence in Hamilton, Ohio, Jan. 31, 1920, in the seventieth year of his age.

Mr. See was better known to the readers of mechanical journals as "Chordal," a pen name used by him for much of his writing.

About 1880 he began a series of articles in the *American Machinist*, then a struggling young paper, under the title of "Extracts from Chordal's Letters." These articles were of the shop by a shop man and their popularity contributed greatly to the success of the *American Machinist*. They attracted widespread interest, and through their influence more than one young man has been inspired to do better and greater things.

Mr. See was born in New York City on May 19, 1850, and was the only child of George C. and Sarah See. Both his parents, while natives of New York, were descendants of sturdy and vigorous ancestry of Huguenot origin.

Mr. See received his earliest education in a country school at Rutland, N. Y., though he later attended schools at St. Louis, Arcadia, and Springfield, all in Missouri. In the latter place he got himself into trouble by teaching some darkies how to read. Though he did not know it, this was contrary to the law, and his father was waited upon by a committee and told that such proceedings would have to be stopped.

At the outbreak of the Civil War young See was employed in the Springfield military hospital as an assistant in the dispensary and in the operating ward. After the battle of Carthage he was made telegraph messenger to the Federal forces in and around Springfield.

Upon the ending of hostilities Mr. See served an apprenticeship as machinist at the Springfield Iron Works and it was there he laid the foundation for his future career. At the completion of his apprenticeship he found employment in various shops located from St. Louis to Yanktown, S. D., eventually settling at Omaha, Neb., where he started a shop of his own.

The story is told of him that being disappointed in a lathe he bought from the Niles Tool Works he wrote to that firm to the effect that if he could not design a better lathe he would eat it. Alexander Gordon, head of the Niles Works, testily replied that if he was able to design a better lathe than the one in question he wished he would come to Hamilton and do it.

Long after Mr. Gordon had forgotten the incident there appeared in his office a tall, lanky individual who said with a drawl, "My name is See and I came up here to design that lathe for you." He was put off with one excuse after another until in disgust he appropriated an empty drawing board and did design a lathe that made Mr. Gordon sit up and take notice.

He was at once employed by the Niles Works, filling positions as foreman, chief draftsman and chief engineer respectively.

In 1876 Mr. See opened an office in Hamilton as a consulting mechanical engineer and his keen insight into mechanical matters soon brought him a wide practice in connection with some of the largest machine establishments in the United States and Europe.

With the invention of the telephone Mr. See became greatly interested in its practical workings and was the inventor of several valuable devices connected with central-station apparatus. In recognition for his work he was made an honorary member of the Telephone Exchange Association. For a time he was editor of the *Telephone Exchange Reporter*. He built the first telephone line in Hamilton. Also, in connection with Alexander Gordon and James K. Cullen, he built an electric-light plant at the Niles Tool Works, the first in Hamilton.

As Mr. See's business increased he became a patent attorney and as such developed an enviable reputation as an expert in patent litigation. He has been called upon to give expert testimony in more than three hundred cases, among which was the litigation involving the validity of the patents issued for the original McCormick reaping machine.

He took great interest in airplane development and was counsel for Wright Brothers in their litigation with the Curtiss company.

By appointment of Governor Campbell, Mr. See acted as one of the commissioners for Ohio to the World's Fair held at Chicago in 1893.

Perhaps we cannot pay a better tribute to the memory of Mr. See than that contained in the following telegram from James K. Cullen, president Niles, Bement, Pond Company, to one of the Hamilton papers:

New York, Feb. 2, 1920

Hamilton Daily News: In the death of James W. See, Hamilton has lost a most exemplary, gentle and kindly gentleman, and an able and widely known engineer. His interest in the welfare of the city was always manifested and he lent liberally of his time, his money, and his ability to enhance its reputation and improve its condition.

While modest and unassuming to a marked degree, his knowledge of mechanical and industrial affairs brought him in touch with many of the largest manufacturing concerns, and a large number of eminent engineers who greatly admired his talent and appreciated his advice. His literary productions were read and favorably received by employers and employees engaged in mechanical pursuits throughout the country, and brought prominently before the people, not only the man, but the city of which he was a resident.

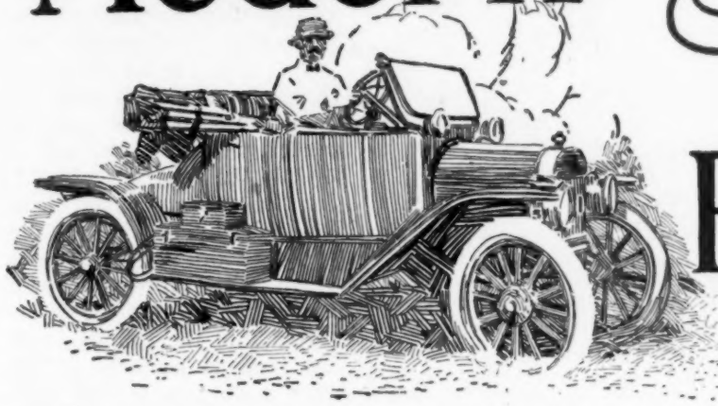
Honest and honorable, he was trusted implicitly in all business transactions, and socially, while of a retiring disposition, he endeared himself to a large circle of admiring friends who will sadly miss him in the years to come.

JAMES K. CULLEN.

On June 1, 1881, Mr. See was united in marriage to Miss Hester R. Rose, of Forestville, Ohio, by whom he is survived, together with three sons and one daughter: Robert M., of Chicago, Ill.; Willard and Howard, of Atlanta, Ga.; and Mrs. Thomas A. Allen, of Evanston, Ill.

Mr. See was a charter member of the American Society of Mechanical Engineers, a member of the Franklin Institute, the Hamilton Club and the Union League Club of Chicago.

Modern Ford ENGINE Repairing



By L. M. MANLEY

During the war when new cars were not available, repair shops and service stations looked about for labor-saving machinery for overhauling and rebuilding used cars. The success of their efforts is manifested in the complete line of such devices now on the market for Ford service stations and described in this article.

BACK in the good old days when people traveled afoot or on horseback, there lived in a small Midwestern city a man who, according to his sign, was known as John Wilson, "general machinist, gas- and steam-engine repairing a specialty." There were a few "horseless carriages" in this town, and their constant recurring need of repairs and adjustment prompted Wilson, with an eye to the future, to add to his shingle the legend, "Automobile Garage."

The author recalls many hours spent in Wilson's shop in boyish wonderment and admiration, as grease-besmeared Mr. Wilson knowingly made this or that adjustment. He has also vivid recollections of the first tourist, whose car had sustained a broken connecting-rod while attempting to negotiate a sandy stretch of road known as "The Mile Hill." It took about 10 days to replace that rod, as it was necessary to make a forging, machine it, and fit it to place, for interchangeable parts and quick-repair service were in an embryonic state at that time. There had been considerable publicity given the work, so that when the car was ready for a trial run, the whole town turned out to witness the performance. To everyone's surprise the engine ran, and Mr. Wilson's first real job of automobile repairing was successful.

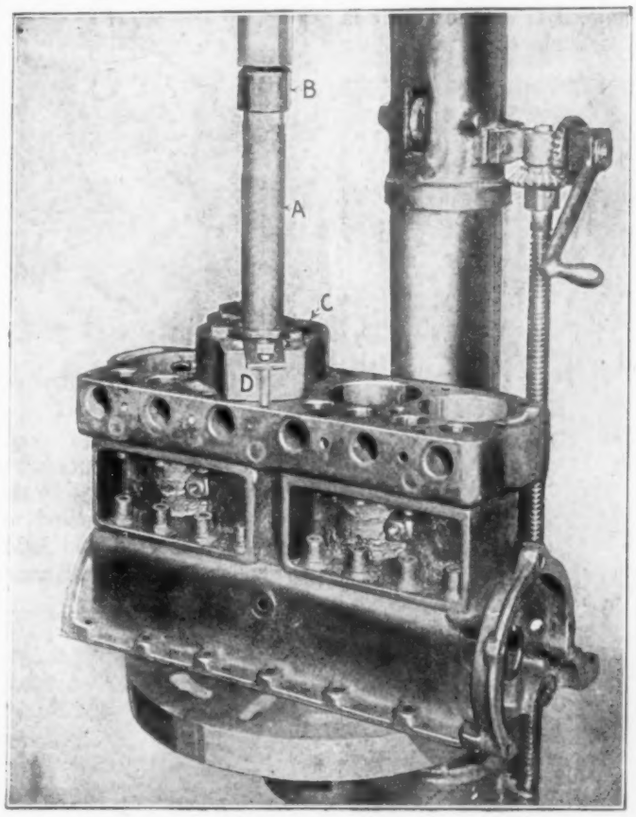


FIG. 1. THE CYLINDER-REBORING MACHINE

This repair was made on one of the first cars built by Henry Ford, and is in striking comparison with the present-day repair and replacement equipment which is now the complement of the Ford car. Today, a car owner can leave his car at any first-class service station on his way to work in the morning, and, if the occasion demands, he can get it in the evening completely overhauled and practically as good as new. That this service is possible is due to large quantities of spare parts kept in stock in the service station and the recent adaptation of manufacturing methods and equipment to repair work, modified, of course, to suit conditions.

Realizing the need for such labor-saving machinery, the Fairbanks Co., after considering the situation from all angles, has assembled, and is marketing a line of special machinery and devices for Ford and Fordson service stations. This company has also established schools in its principal branch houses where instruction courses are given in the use of the machinery and in service-station organization. This equipment duplicates to a marked degree the machinery, tools and fixtures used by the Ford Motor Co., and is of considerable interest to anyone having to do with motor cars, trucks, or tractors.

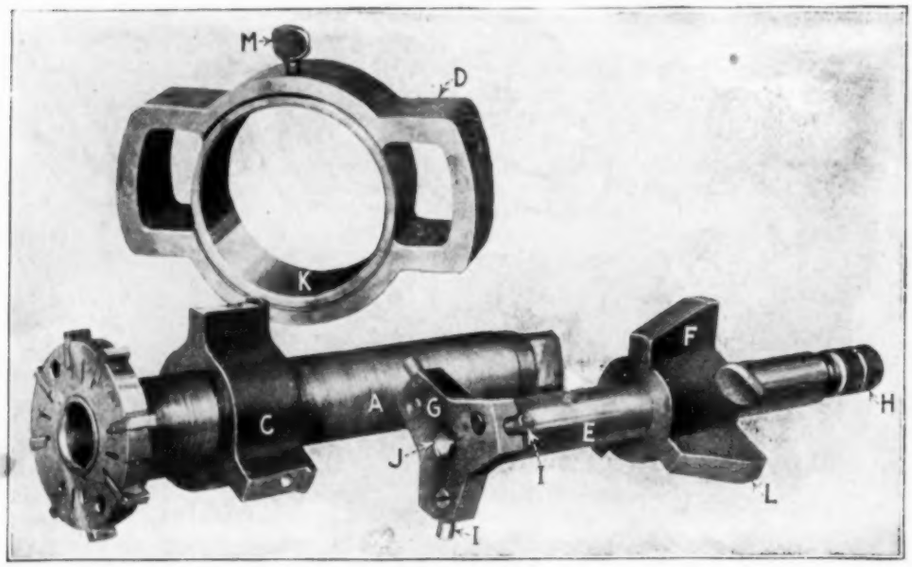


FIG. 2. THE DETAILS OF THE CYLINDER-REBORING MACHINE

In modern service stations, there is a sequence of operations which is rigidly followed in a complete overhauling of a car. There are mechanics or groups of mechanics who are responsible for certain details of this sequence; such as the radiator and body work, the engine, the transmission and chassis, the ignition and all the electrical parts, the assembly and final testing.

As soon as the engine is removed from the car it is dismantled and the cylinder block placed in a drilling machine ready for reboring the cylinders. This operation, shown in Fig. 1, is accomplished by means of a special boring tool. An inserted-tooth cutter, which can be set for any standard oversize piston, is held by the threaded feed bar *A*, which is turned by the chuck *B* on the drililng-machine spindle. The bar is partly guided by the nut *C* held in the collar *D*, which is clamped to the cylinder block. This reboring tool is shown in greater detail in Figs. 2 and 3. The pilot bar *E*, together with the centering gage *F*, is inserted into the cylinder with the inclined surfaces of the gage resting on the top edge of the cylinder bore. The bar is then lowered until a witness mark on the bar coincides with the top surface of the gage. The thumb screw is then set which positions the bottom gage *G*; while turning the knurled nut *H* expands the spring stops *I* at *J*, thus accurately centering the pilot bar. The collar *D* is slipped over the gage *F* and is positioned by the bushing *K* and the surfaces *L*. The collar is then clamped to the cylinder block, after which the gage *E* is removed and the threaded cutter bar assembly inserted and held by the threaded nut *C* in the collar *D*. the thumb screw *M* preventing the nut from

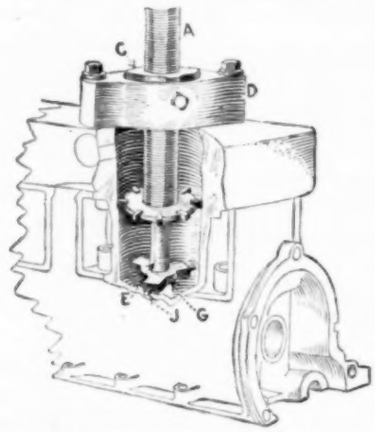


FIG. 3. ANOTHER VIEW OF THE REBORING MACHINE

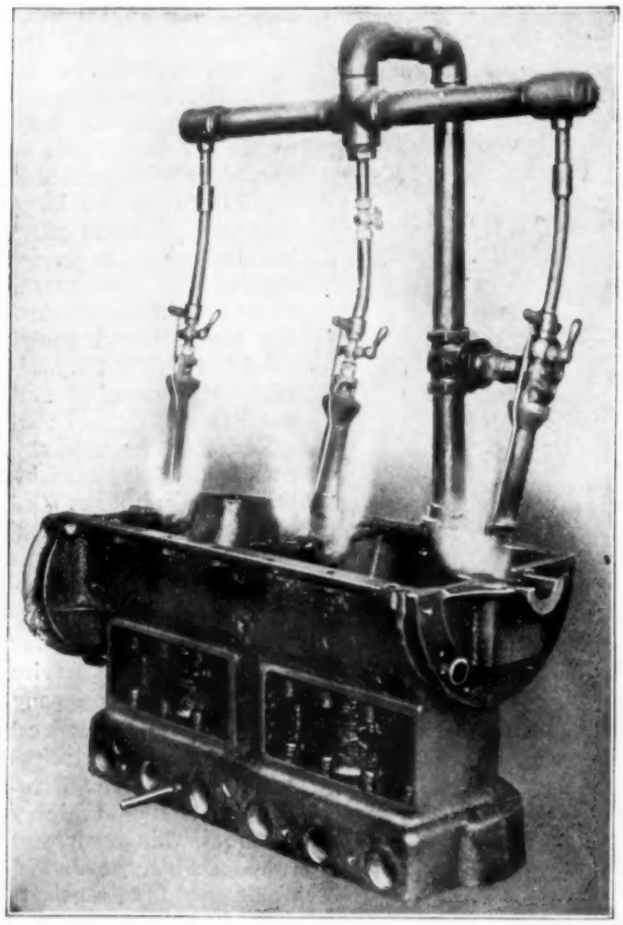


FIG. 4. MELTING THE BABBITT FROM THE CRANKSHAFT BEARINGS

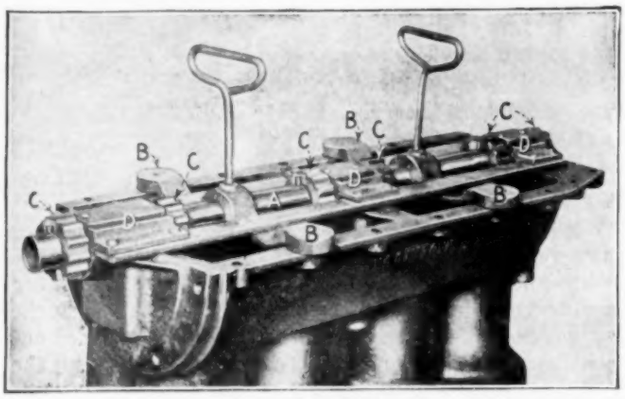


FIG. 5. A JIG FOR REBABBITTING THE CRANKSHAFT BEARINGS

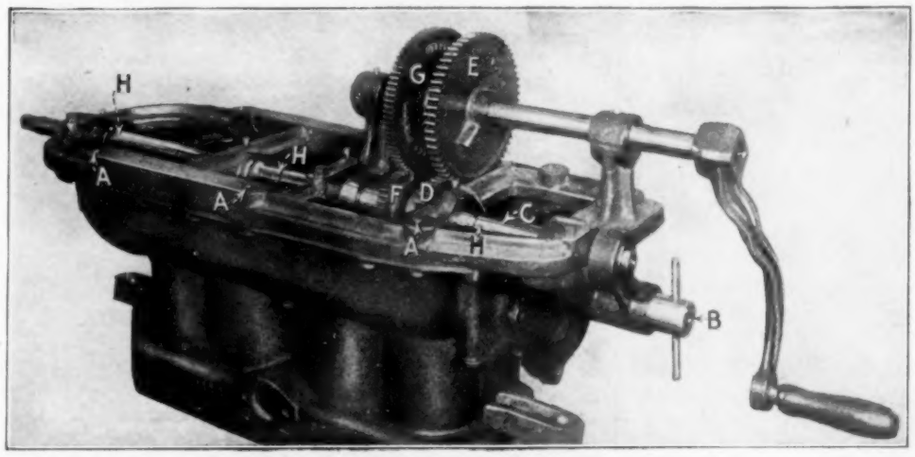


FIG. 6. HOW THE BEARINGS ARE BORED

turning during the boring operation. The accuracy and smoothness of the cylinder bore produced by the cutter is such that subsequent boring or rolling is not required. About 20 min. are required for reboring all four cylinders.

After the cylinders are rebored, the next operation is the rebabbitting of the main crankshaft bearings. The babbitt is melted from the cylinder block by gas torches, Fig. 4, which also preheat, at the same time, the cylinder casting to the proper temperature for babbitting. A rather unique jig which insures correct alignment of the bearings has been designed for the rebabbitting operation. The babbitting mandrel *A*, Fig. 5, is positioned by the pin stops *B* inserted in the crank-case-mounting screw holes as shown. The mandrel is then clamped in position by means of the eccentric lock blocks *C*, which also prevent any leakage of the babbitt metal. The babbitt is poured through the ports *D*, and after the metal has set the jig is removed by means of the handles. The bearings are next rebored by the main-bearing boring machine shown in Fig. 6. The machine is accurately located on the cylinder block by pins passing through the holes *A* into the crank-case-mounting screw holes and by two centering pins *B* which fit the camshaft bearings. The boring bar *C* is turned by the pinion *D* which is driven by the master gear *E*, while the feed is accomplished by a special feed screw driven by the pinion *F* and the master gear *G*. The boring is done by the cutting tools *H* held in proper position by setscrews. Special gages are provided for correctly setting the cutting tools to meet the diameter of the crankshaft bearings. The time consumed in the babbitting operations is about 30 minutes.

After the crankshaft has been thoroughly overhauled and all bearing surfaces trued up as required, it is fitted and lined up in the cylinder block and the bearing caps fitted with a slight rock and the bolts drawn down as tightly as possible. In modern service stations, the bearing caps are rarely rebabbitted as new caps ready for assembling can be purchased for less than the labor cost of rebabbitting the old caps. The cylinder block is now mounted lined up in the bearing burning-in machine shown in Fig. 7. The machine, which is run at approximately 200 r.p.m., is started and the bearing surfaces of the babbitt are burnished or burned-in. In this way a 100 per cent bearing surface is obtained in less than 1½ min., against the old system of scraping the bearings, which usually takes from 5 to 7 hr. and results in only 40 to 50 per cent.

While the foregoing operation is in progress the connecting-rods are being overhauled and tested for alignment in the novel fixture shown in Fig. 8, the operation of which is apparent from the illustration. An efficient device for holding the piston while reaming the wrist-pin bushing and for assembling the connecting-rod is shown in Fig. 9.

After the burning-in operation on the crankshaft bearings is completed, the pistons and connecting-rods can be installed or fitted in the position shown in Fig. 7, without removing the block from the machine. The burning-in of connecting-rod bearings is similar to the

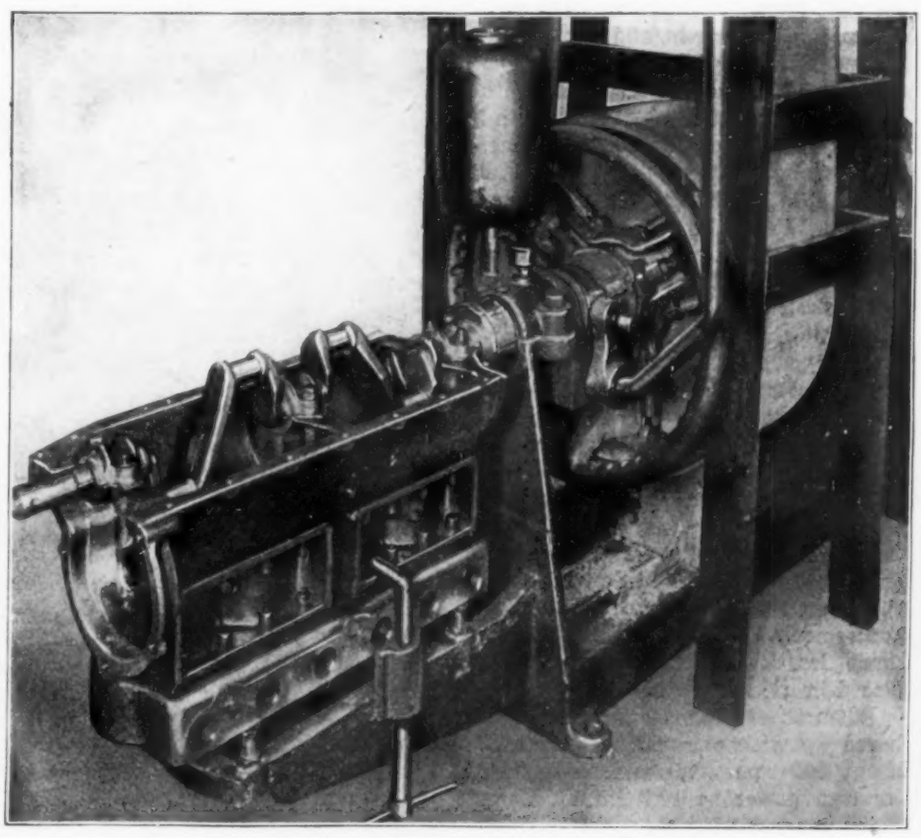


FIG. 7. BURNING-IN THE CRANKSHAFT BEARINGS

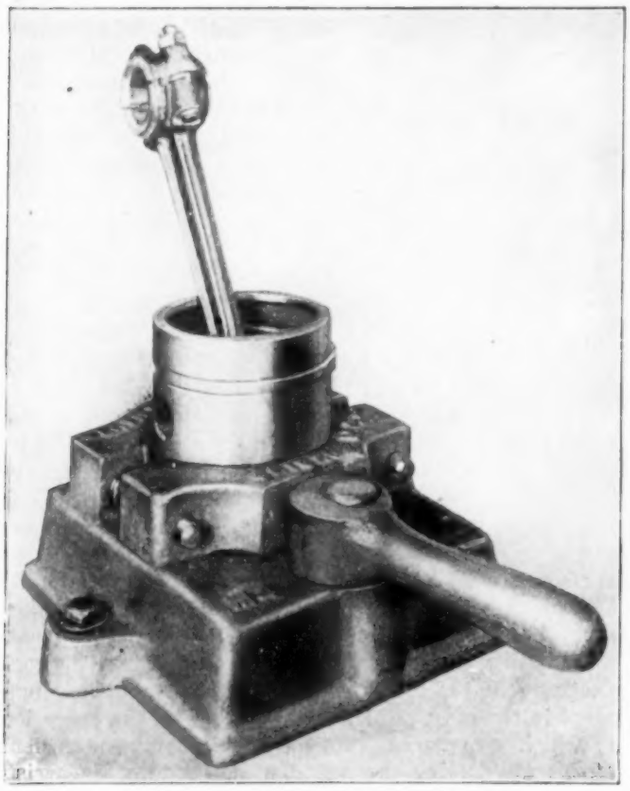


FIG. 9. A NOVEL PISTON CLAMP

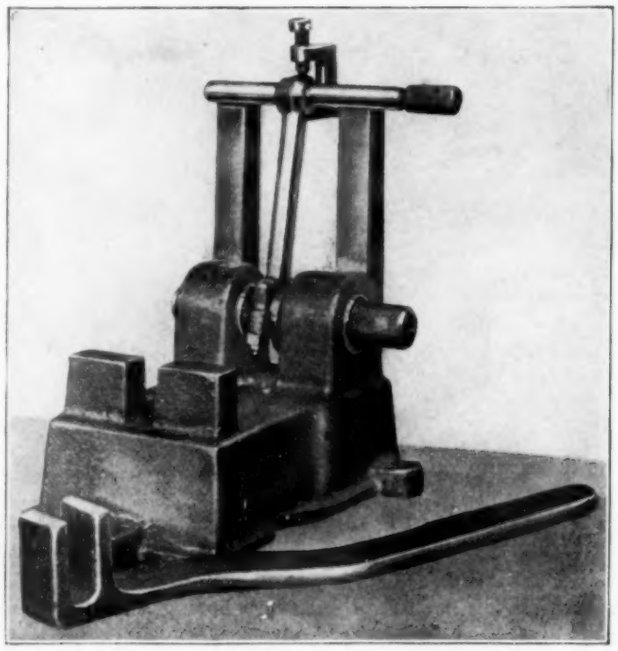


FIG 8. CONNECTING-ROD ALIGNMENT JIG

operation just described under the caption of "burning in," except that the main bearings now run in oil, and it is during this operation that the stiffness of the motor and bearings can be determined without removing the unit from the machine. The machines for burning-in and running-in are made in various sizes and designs to meet the individual requirements of the service station. However, the one illustrated is a double-end machine. By referring to Fig. 10 it will be seen that the engine block with the transmission unit which has been previously overhauled, is mounted in the position shown. The camshaft, timing gears, and the valves are assembled and given a running test. Incidentally, during this last test it is possible to grind-in the valves, as the revolving camshaft imparts the correct vertical motion required for valve grinding. Finally the complete engine unit is assembled and the motor is run-in and limbered up. During this time a thorough test of the valves, timing, and ignition can be made and it is obvious that the expense of making adjustments during this time will be much less than if the motor were placed in a chassis before testing.

When the motor is sufficiently limbered up with oil, which is done at about 600 r.p.m., it is started under its own power so that all oil leaks, noisy gears, timing magneto and carbureter trouble can immediately be detected and corrected. Similarly, special equipment has been designed for overhauling the transmission, front and rear axle, crankshafts and camshafts, and, in fact, every detail of the car, so that after the final assembly there is little left for the final testers to do.

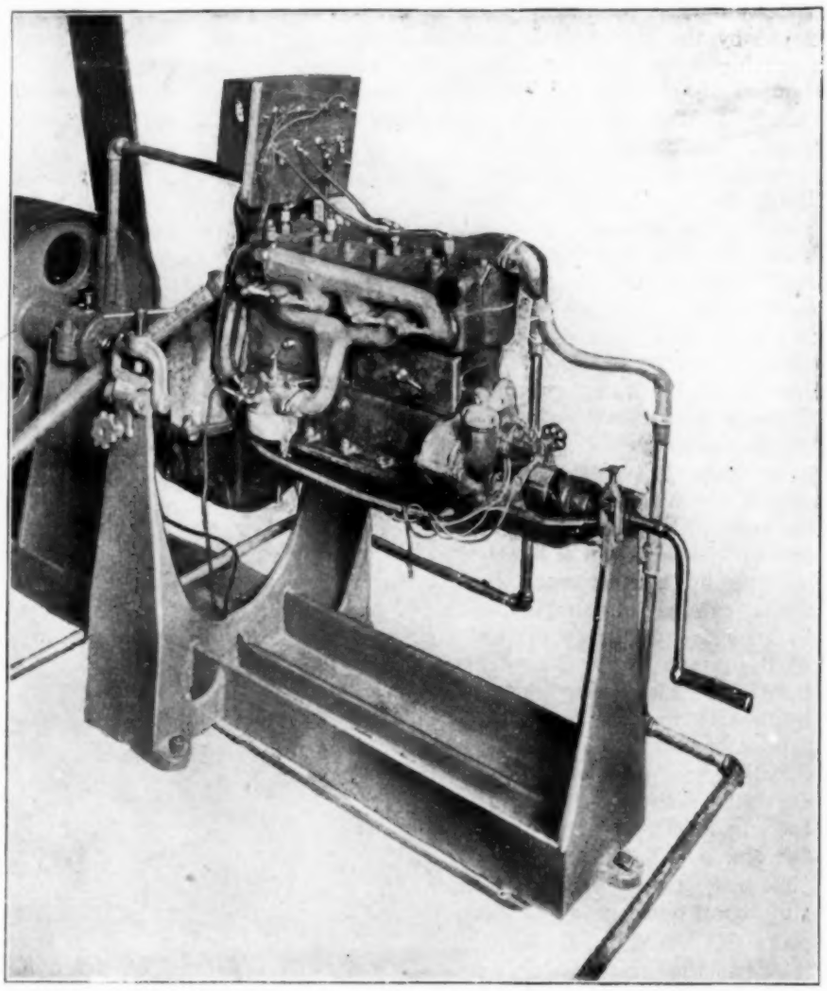


FIG. 10. RUNNING-IN STAND FOR FINAL ASSEMBLY OF MOTOR UNIT

Some Functions of the Employees' Magazine

By JOHN T. BARTLETT

The shop or employees' magazine has, of late years, been recognized as a factor in industrial administration. Men like to read intimate items about their work and to see their names in print. The author tells something about a certain shop magazine and its editor. He also gives some pointers as to messages to the men through the medium of such a paper.

ARCHIE BEEMAN had knocked about in one occupation and another, and, when he suddenly blossomed out as a full-fledged newspaperman, he still retained much of the viewpoint of the man who works with his hands for wages. He was a good newspaperman, too, and friends deplored it, when, losing his berth on the "Morning Beacon," he started to work in a local shipyard where he could earn more money. Archie is democratic, and earned his pay, as "No. 1107," with the best of them, week in and week out.

The shipbuilding company saw the business advisability, after a time, of an industrial-relations department. This new department was quickly knocked together, but it was no less efficient. It comprised a superintendent, who was a member of the company; a general assistant; the safety engineer; the employment office head, and the editor of the plant publication —the editor of which was Archie Beeman. It was a case of somebody picking the right man for a particularly exacting job. I know—because I am acquainted with Archie's work with this new kind of publication which is no less important because it often comes out in humble dress.

Picture to yourself a clean-cut, rather slender young Scotchman in his thirties, a family man with kiddies of his own, a good mixer who remembers and is remembered by everybody he meets, an intelligent fellow with a grasp of business principles, a man who gets the viewpoint of the company without losing that of the men—and you have Archie.

We are considering some problems and functions of the employees' magazine, and Archie Beeman's well-conceived publication, "The Proper Job"—not the actual name, but it will do—furnishes some good examples of how definite and very significant things are done. The point which must not be forgotten is that in some ways it is infinitely easier to do these things wrong than right—unless the editor is just the right man; no mere talent in word-stringing will do. The editor of the plant publication must have ability of a high order, else the publication will likely do more harm than good.

Every individual industrial enterprise, whatever the product, gathers to itself an atmosphere distinctly its own, and this atmosphere, correlated with a tangible "shop spirit," is an offshoot largely of the relations between employer and employees. Under former conditions, this spirit more or less just happened. We are beginning to understand the importance of deliberately, carefully cultivating it. That is where the employees' magazine fits in. We have begun to appreciate the cash value of cheerful, contented working spirit; a year-in and year-out joining together of employer and employees.

The employees' magazine is a poor little orphan in the plant where employer and employees fence with one another, with distrust and suspicion on both sides, and with each holding "cards up their sleeves."

In the initial issue of the Acme plant publication, John M. Stead, the plant manager, in a signed message headed, "To All Acme Employees," touched on the company's biggest problem, but only to tie it up with the general matter of relations between employee and employer. There was possibly a thousand words in this talk by the plant manager. A photograph of John M. Stead accompanied the article.

We cannot quote Mr. Stead's message in full, but the following extracts will suffice to indicate the fine spirit which permeated it and its general character.

"There is no keener competition in the industrial world today than is found in the shipbuilding business, and the plant which will continue to exist and offer employment to a large body of shipbuilders is the one where waste time and waste material are eliminated and where the employer and employee feel that they are getting value received.

"We feel that it is not only the desire but the intention of each individual in the Acme plant to place that plant where it will be on a firm competitive basis, and will continue for years to come. Success for the firm can only be measured through the combined success of the individual employees.

"The management which exacts service on the part of its employees and fails to give service in return is definitely at fault, and cannot hope for success. With this in mind the management of the Acme plant is, through the planning of work, the proper location of machinery, and the placing of service stations as near the work as is possible, endeavoring to place the employees in the position where they do not waste their energy and where every effort counts toward the actual production of ships. In this manner we feel sure that the mechanical problems will be handled with satisfaction—if we have the benefit of the recommendations of every thinking man in the plant.

"With the mechanical problems in hand and in a fair way to being satisfactorily solved, we still have even greater problems of the individual employee as to his working conditions, his pay, and his means of presenting these problems to the management. To my mind there are none better fitted to study or present the problems of the employees of this plant than those employees themselves. Problems in regard to working conditions will be with us as long as we exist as a plant, but it is not necessary that they shall be the cause for dissatisfaction or dissension on the part of any individual or group of men.

"If we co-operate in spirit as well as in letter, we can eliminate our troubles by eliminating the causes, and it is with this in view that we most heartily desire definite representation for the employees in the form of shop committee which can handle these problems at their inception."

Mr. Stead then outlined a clean-cut, workable plan,

utterly devoid of red tape, whereby problems—call them complaints or grievances, if you like—could be settled to the employees' satisfaction. It was expected that the shop committee, made up of employees of the plant, would settle at least nine out of ten problems which arose. When this direct treatment did not suffice, the matter was to be taken up by a shop-committee member with the department superintendent and the industrial relations department. If no satisfactory agreement was reached at this stage, the case would be presented to the shop committee as a whole in conference with the plant management. Where the matter was of trade-community scope, the shop committee and plant management would confer with the metal trades council.

The Paper's Vital Relation to Company Policies

Mr. Stead's message to the men, which we have quoted, will illustrate a point or two. The man-to-man, above-board, straight-from-the-shoulder style was admirable. We might as well get this side of the employer-employee relation right at the beginning, because it is of fundamental importance. "Talking down" to the employees is absolutely wrong. The message does not need to be "adapted" to them, in the sense of a presumption that they are beings of inferior intelligence. They should be talked to as equals. Mr. Stead talked in that way. And he meant what he said.

The plant publication should be a pleasant, cheerful, happy little sheet, touching on many subjects in a light, even jovial, way. But all the time it should be serious, mighty serious, underneath. Its definite editorial policy, handled by a tactful, intelligent editor, should always stay in line with a real, tangible spirit of co-operation between company and men.

Archie Beeman surely understood his job. One of his creations was, "Sayings of Shipyard Sam." Sam was a semi-humorous character done into cartoon by the yard artist, J. Sheds, Archie's close ally. Here is a sample of Shipyard Sam's philosophy.

"Say, pard, have you seen that guy Rumor Monger? I told you what I did to him last week, but he's still at it, and if I get another chance at him he'll be fit for the hospital. The new yarn he is spinning is a hot one. He's passin' the word aroun' that we pieceworkers are going to get a cut. Where he got that dope from is more than I can fathom, but he's got a lot of poor fish worried; some of them are even slowin' down on the job to keep their production small.

"Why, I was talking to the Big Chief myself, and he says, 'Sam, I want you to tell the boys for me that we are doing big things in a big way at Acme, and when we get good men we want to hold onto them, and furthermore, we are willing to pay them, and pay them well. Production is what we want. A well-paid, efficient organization is far more economical than a moderately or poorly paid, less productive organization. We prefer the former, Sam, and I can guarantee you there is no cut in the wages, either time or piecework, contemplated by the management here.'

"Now fellows, that's official, and if you meet this Rumor Monger, hold him and send for me. I'd like to make a short address and farewell to him."

Sam was depicted in argumentative posture delivering his talk.

In what more effective way could uneasiness over wages have been banished? Of course, the management might have handed Archie Beeman a signed statement to use, but Shipyard Sam was an infinitely better device. He stood as a symbol of the above-board, open policy between company and men, and because he was Shipyard Sam, he could use language which would drive the thing home, and drive it well. The whole added effectively to the familiar atmosphere of the plant publication.

In contrast to the "Shipyard Sam" way of treating a subject without gloves, the writer recalls an example of the wrong way to endeavor to correct an abuse. This appeared in an employees' magazine of a coal-mining company. It had to do with smoking in a gaseous mine—a criminal offense. In the straight newspaper manner this publication commented on a criminal conviction and caustically used "miserable hides," and other strong expressions in connection with a discourse on the subject.

This was tactless, though every word of the diatribe was absolute truth. The mistake was in letting the company say severe things to employees in the form used, when some such device as "Shipyard Sam" would have run no risk whatever of offending, though language twice as harsh and highly colored within quotes was used. The strategic angle from which to approach the problem was the standpoint of the conscientious employee, to whom really the matter was of most consequence, inasmuch as the flagrant carelessness of others endangered his life. We know the typical happening when an outsider starts to tell the bald truth about a member of our family. We may know he tells the truth, but he antagonizes us.

Archie Beeman's Way of Correcting Wasteful Practices

To get across, the employees' magazine must be a genuine friend of the men, must treat things in a friendly way, must fairly radiate a spirit of fellowship.

It's just a case of the personal relation being exalted to print. The editor of a good employees' magazine can accomplish the result, just as Archie Beeman has done, right from the first.

Archie had ability to turn to account that spirit of fair play innate in a majority of us. "I'm doing my part—now do yours!" is the straight-from-the-shoulder appeal in several masterpieces of little articles by Archie which I have beside my typewriter. He talks in a man-to-man way in these articles. They could offend nobody. They were so patently fair-and-square, that they were sure to have a good influence. Another sort of editor would have "preached," "harangued," or "scored," and would have failed. Listen to Archie. His little article is headed, "Rivet Heaters, Attention!" It goes on:

"Have you noticed that when you come in in the mornings your fire pot has been all cleared out for you, your coke box is full and frequently you find kindling lying 'on the job' all ready for you to light up? Have you noticed that no more do you have to pack across a sackful of coke on your shoulder or lug a boxful of rivets half across the yard? Sure you have.

"These things have all been done for your convenience. Here's one way in which you can help wipe off the score:

"Pull out all rivets from your fire before you quit for lunch and before you hit the road for home and mama at 4:30, and be sure to turn the air off.

"Every afternoon when the service squad goes its rounds of the fire pots it finds a number of rivets absolutely ruined by being left in the pot with the

air turned on. Of course, the turning off of the air only delays the burning of the rivets a little; the only way to make sure they won't be spoiled it to take them out before you quit.

"D' you know that an average size rivet costs the firm about three cents? Suppose you allow half a dozen at noon and half a dozen at 4:30 to be burned; that means you have cost the firm 36 cents where there should have been no expense a-tall. Assuming there are 60 heaters in the yard and they are all careless about their rivets, they will waste $21.60 worth of rivets per day, or about $120 worth per week or over $6,000 in a year.

"Rivet heating is one of the first jobs a youth strikes in the yard and many may not realize that a share of the future of the yard lies in their hands. Yet, the above will show where they can cut down the costs considerably and every useless expenditure of a dollar cut out will enable the firm to compete for new orders on more equal terms with our competitors."

The Good Workman Respects His Job

Such articles are fundamentally compatible with the proper policy of an employees' magazine—which is one reason why the employees' magazine is potentially a powerful institution for good. The good workman respects his job. He takes pride in it, if he does it well; and, if he doesn't do it well, he knows he ought to, or there is something wrong with him. This presupposes, of course, that working conditions satisfy him. If he believes the employer is "doing" him he begins to lose efficiency and works in an atmosphere that is radically wrong. At Acme, the company was actively pursuing a policy of a square deal for every worker. It was paying high wages, and it let the employees know that it was paying them gladly. In return it frankly expected good, conscientious work. It let the employees know that conditions in the shipbuilding industry were such that without high efficiency the plant would not remain permanently in business.

Beside a snapshot of "Service Reilly" smoking a pipe at noon, "The Proper Job" carried this message, headed, "Are You Getting It?—Service":

"Riveters and bolters up. Are you getting it?—Service.

"When you take your wife or sweetheart to the show we have sometimes heard you beef about the street-car service. Also sometimes after the show when the big feed is on, or should be on, you frequently grunt out, 'Rotten service!' And we also have sometimes heard the same expression in the yard!

"In the last few years, there is hardly a word in the English language which has been studied or digested more by business men of all classes than the word, 'service.' Whether it is running an ice-cream parlor, department store or a shipyard, this new science, 'service,' has come to be demanded.

"In these days of keen competition this firm realizes that having what you want, where you want it and when you want it, is going to be one of the big factors in the success or failure of its future plans.

"Boys, our Service Department is open at all times for suggestions for its improvement. We believe we have improved somewhat, but we are not yet satisfied. We want to be able to shoot your wants in bolts, nuts, and rivets through the wicket in the service stations with the same dispatch as you get your favorite tobacco over the counter of an up-to-date cigar store. But we must have your co-operation to make it the success we wish. You can sure help out by cutting down all possible waste both of material and labor; the material by the large quantity of rivets which are needlessly burned; the bolts by the large number which are needlessly stripped and the labor by only taking as many rivets and bolts away from the service stations as you think you will use. Otherwise, large quantities are left lying around at night which the cleaners have to pick up and send to the salvage department where they are separated, the good from the bad.

"Boys, we have been making a record during the past months in the way of cutting waste, and with your co-operation we can still greatly improve this standard. Help us to show the firm we appreciate the expenditures they have made for Service."

A Clever Cartoon and Acrostic

Such material as the foregoing is only one kind of several which should go to make up an employees' magazine. A super-abundance of it would tire the employees and defeat its own purpose. But it is in the handling of such material possibly more than in any other that the employees' magazine editor is likely to "fall down." Though he consult at length with the management, though he obtain O.K. for all material before publication and hedge himself about with a dozen precautions—he must possess ability or he will surely fail. It is writing "work" that calls for talent of a high order.

The ingenious editor finds various ways of hammering away at wasteful practices. We have given some actual work by Archie Beeman. Here is a good example from the employees' magazine of one of the leading railroads.

The amateur cartoonist among the employees is a first-class ally of the editor. Not only is the cartoon in itself particularly effective, conveying a big point in an instant which a column of type might fail to drive home, but the fact that an employee draws the cartoon is a strong feature. The cartoon done in a good-natured way by an employee is taken in the same spirit by those who can profit by it.

The railroad-paper editor referred to, used in the summer a telling cartoon entitled, "The Blower On and the Pop Up," depicting a locomotive in that situation, and there was the further label, "This Is a Careless Engine Crew. They Are Wasting 20 Lb. of Coal a Minute," drawn in by the cartoonist.

Two or three issues later, the editor republished the cartoon, and below it an acrostic which it had suggested to another employee. Below the cartoon, and a caption, "Don't Advertise Yourself This Way—Save The Coal," was the following:

The POP tells the tale of
How much COAL YOU WASTE on
Engines in your charge, by
Popping in the ENGINE TERMINAL,
On the READY TRACKS, or
Popping on the LINE OF ROAD.
It never works unless YOU MAKE IT WORK, and then it
Shows up your lack of interest and care in your work,
And costs at the rate of TWO DOLLARS AN HOUR for the
Twenty pounds of COAL YOU WASTE
Every minute the POP IS UP.
Let ENGINEERS AND FIREMEN,

Let ROUNDHOUSE FOREMEN, ENGINE WATCHERS, HOSTLERS, and all concerned,
Take a real interest in KEEPING THE POP DOWN
And see that all who work with you
Learn to SAVE COAL and not to waste it on the
Engines YOU HANDLE.

In connection with all such employees' magazine methods to improve morale and raise standards—and the methods have application to big and little industries of every kind—is the basic principle which makes them practical and is what has been termed, "the spirit of the good workman." Whatever the job we do, whether high or low, it is worth doing well. The employer who has a contempt for the sort of work his employees do had quickly better cultivate a different attitude. It may be paradoxical, but the best guarantee an employee doing humble work has that some day he will be many rungs higher up the ladder, is that he love that humble job, study it from day to day and develop maximum efficiency at it. That is the spirit of the good workman. Whatever the job is, it is worthy of the best that is in him.

"Jack of All Trades, Master of None" Not a Modern Proverb

The first men to raise good workmanship to genuine idealism were not employers, the guiding heads of great industries. They were plain working men who took pride in doing a job not passing well, but exceptionally well. The disposition to do this is rooted deep in human nature. Rather than being a new thing, it is a heritage of the centuries. The spirit of the good workman has come down through the ages. "Jack-of-all trades, master of none!" is not a modern proverb, a product of this age of extreme specialization. It was first aptly said in the days when all work was done by hand, slowly. It had its birth in that great belief of humanity, that the job is worthy of the laborer's best skill.

Archie Beeman's tactful articles, mixed in with much of another nature, fostered this spirit with sympathetic touch. So did the cartoon of the engine which was burning superfluous coal. So did the acrostic which was added, "The Pop Is a Telltale." So can the employees' magazine of a thousand and one individual industrial enterprises. While exerting a steady influence for more efficient production, thereby gladdening the employer's heart, the interests of the employees are furthered to an equal degree.

Out of a recognition of mutual interests the employees' magazine grows into a business institution well-nigh indispensable.

A Man's Pay Should Equal the Value of His Production

By John F. Clark

The article under the above title, by John S. Watts on page 43 of the *American Machinist*, gives some good suggestions and would, if followed, go a long way toward the solution of the present unrest and dissatisfaction, provided the relative values of production could be fairly and accurately determined.

An instance is given where a foreman, by his superior knowledge, is able to increase production, and the value of the increase of production of all the men under his supervision is accredited to him. This, no doubt, sounds quite fair, but who is to determine whether the foreman is entitled to all the credit, or whether he did not gather some of his ideas from the workmen?

Many cases have been known where valuable improvements on certain machines were made possible in the first place by the suggestion of some workman, but in how many instances has the credit been placed where it should be? If the improvements have been the means of increased productive value and thus greater profits, should not a share, at least, belong to the one who made the first suggestion?

To illustrate the impossibility of determining just where to place credit for increased skill and production, the writer has in mind a certain case which recently came under his observation and which is typical of everyday happenings.

A Typical Case

A man was transferred from a manufacturing department where he had worked for a number of years, to the experimental and tool department in the same factory. His mechanical skill was limited to the operation of screw machines, and though he was an intelligent man he had had no opportunity of acquiring knowledge of the operation of machines in general.

He was placed next to a man who had many years' experience on high-class work and who was considered the most skillful and able man on the job.

This man, by virtue of his knowledge and skill, was able to instruct his neighbor and give him many valuable hints, so that in course of a year or so the new man had developed into a valuable man, and his pay had come up to within about a dollar a week of that of his instructor. He was highly appreciated by the foreman, who of course took a good deal of credit to himself for his development.

If Mr. Watt's theory should be worked out in this case, would it not mean that some of the credit for this man's increased usefulness should belong to his workmate and that his workmate's pay envelope should show it?

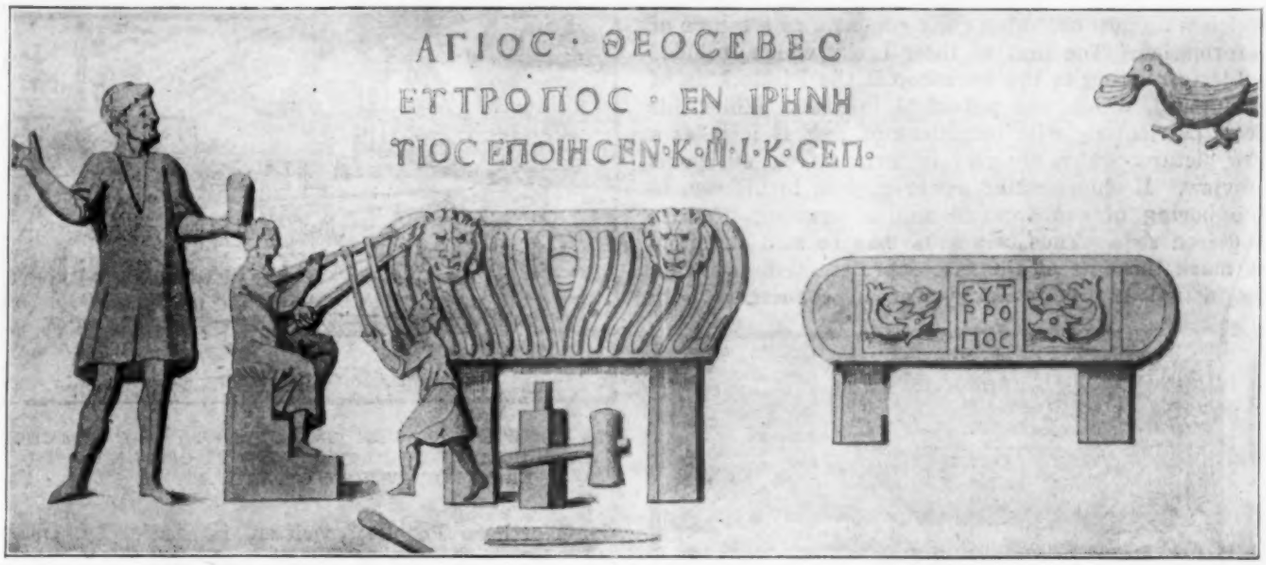
Another thing I have noticed in this particular department is that many times tool designers seek information from some workman concerning methods used and temporary tools made for the production of some particular part, and make use of this information in the designing of permanent tools.

Who Should Get the Credit?

Should this not mean that some of the credit for the increased production made possible by the use of these tools belongs to the workman who gave the helpful suggestions.

To my mind these things are so complex and intermingled that it is practically impossible to determine who shall have the credit for the ideas necessary to increase production, but I do believe that everyone who does his or her best and conscientiously perform their duties are entitled to some appreciation that will make them feel a little more than merely part of a machine.

I see no satisfactory solution for the unrest in the world except, as so often suggested by the *American Machinist*, the operation of the "Golden Rule," and this can only be when men realize the necessity of observing the first and second commandments.



The Evolution of the Workshop—IV

By H. H. MANCHESTER

Developments of the sixteenth century that are of immediate interest in the machine-tool field, were the introduction of printed books on machine tools, refinements in guild organizations and further adaptations of water and animal power for operating trip hammers, bellows, and machinery of all kinds.

(Part III appeared in our Jan. 29 issue.)

ALTHOUGH printing was invented before the middle of the sixteenth century, our knowledge of the conditions in the workshop in the first part of this century is derived chiefly from manuscript sources. A single exception seems to be an engraving of an armory shop by Hans Brugmair, which appears in the life of Maximilian the First of Austria.

This cut, which we reproduced some time ago in an article on ancient helmet making, is of importance in illustrating the various tools of the craft, especially a pair of large shears set in a block very much in the same way as the modern tool would be mounted.

Some of the first manuscript records of the century have already been touched upon in dealing with the work of Leonardo Da Vinci, which for the sake of unity was treated all together, although the last of his designs were produced in the first years of the sixteenth century. Another manuscript which we find belongs to the beginning of this period, or about 1505, is the "Codex Picturatus" of Bem, which included pictures of a number of trades at Cracow, an important Polish City. Among these illustrations is one of a sword maker and an even more interesting one is of a nail maker. This picture is shown in Fig. 25. An important detail in the latter indicates how the nails were headed with the aid of a die in the anvil.

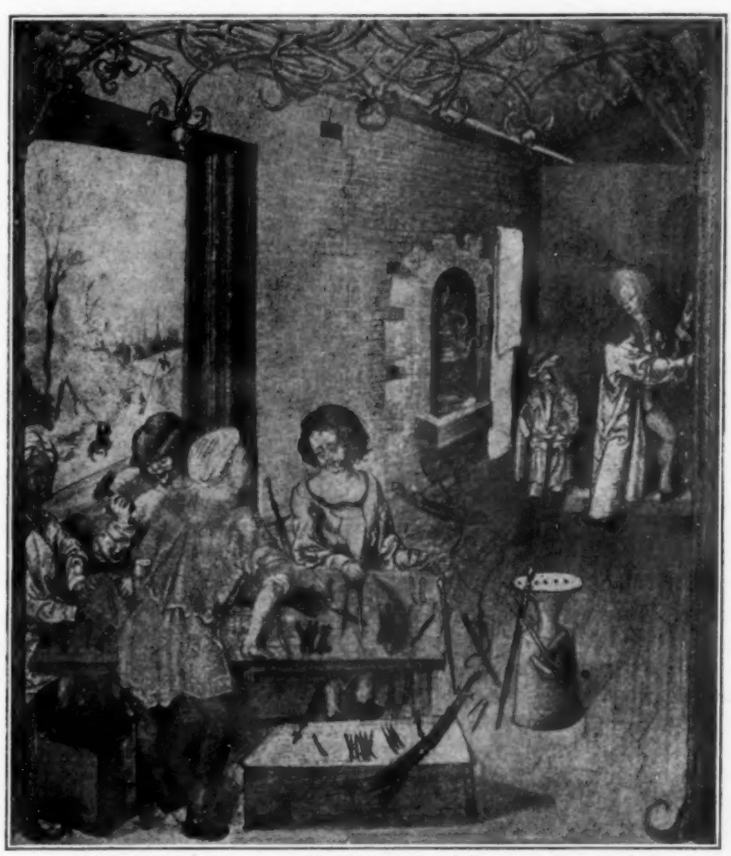


FIG. 25. A CUTLERY- AND NAIL-MAKING SHOP FROM BEM'S "CODEX PICTURATUS," 1505

About 1510, Landauer established a foundation at Nuremberg for old members of the guilds similar to the home founded by Mendel 130 years before. As in the Mendel foundation, various portraits were preserved of craftsmen at work which are today of great interest in the history of industry. One of these pictures dating about 1526 is of an auger-maker. This is probably the first picture showing this occupation as a distinct trade.

It is at this point we leave the age of manuscripts for that of printed books

which were now becoming quite common, as a source of information. The first of these books which included subjects relating to the workshop is the Pirotechnia of Biringucci, which was published in 1540. While this deals particularly with munitions of war, it includes a few pictures which are very important from our point of view. It shows water power applied to bellows, to the boring of cannon, and to the drawing of wire and iron rods. Thus this work may be said definitely to mark the date of the first representations showing the actual use of water power in connection with

FIG. 25. A SMITHY OF 1556

the heavy work of the smith. At the same time, Biringucci shows the processes being carried out by hand, as shown in Fig. 26, so that the two methods were evidently used side by side.

Such application of water power had probably spread throughout western Europe, for there is a note by Ebanus Hessus of a mill at Nuremburg which succeeded in both rolling and cutting iron.

Our first definite notice of a universal joint seems to be in 1545, when such a joint was invented by Hieronymus Cardamus to be applied to the compass. In 1552 we find notice of a second rolling mill being put into operation by Antoine Bruler in France. Another picture, Fig. 27, showing the application of water power to metal work appears in the "History of

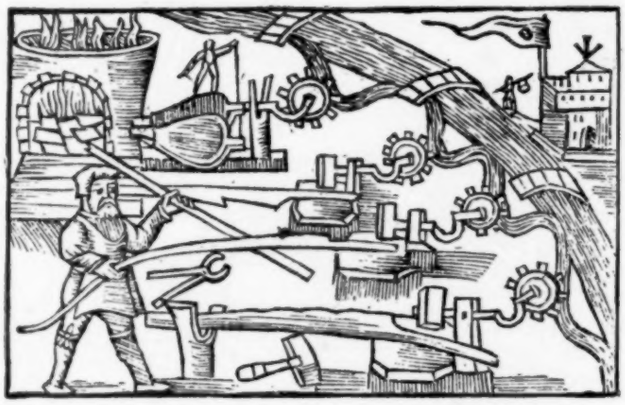


FIG. 27. WATER POWER AS APPLIED TO TRIP HAMMERS AND BELLOWS, FROM THE "HISTORY OF THE NORTHERN PEOPLES," BY OLAUS MAGNUS, 1555

the Northern Peoples," written in Latin by Olaus Magnus, Archbishop of Upsala, and published in 1555. This is a very quaint scene of the interior of a shop in which the bellows and, what is particularly noticeable, three hammers, are operated by little water wheels. This seems to be the earliest picture in which the application of the waterwheel is definitely shown, although this method had undoubtedly been known for some time.

While the work of George Agricola, "De Re Metallica," which was first published in 1556, deals mostly with mining and metallurgy, it contains a few pictures and facts of interest pertaining to the workshop. In Fig. 28 water power is shown in use for blowing a furnace and for operating trip hammers. There is also a rather important picture of the vertical stamp

FIG. 26. ARMORERS, WITH WOMEN ASSISTANTS, ABOUT 1520

mill run by water power, but it is probable that this was used on ores rather than on the metal itself. He also notes that animal power was extensively used for driving various machines.

While we have already noted the introduction of several power-driven machines, it must not be supposed that they were as yet in common use throughout the various guilds of metal workers. This is made perfectly evident from the manuscript cuts of the Dutch engraver, Jost Amman, who made a faithful effort to represent the work of the guilds. These cuts are significant from several points of view. In the first place, they give an idea of the tools and operations which were employed, and, secondly, indicate how the guilds were splitting up more and more into separate trades.

FIG. 29. LOCK AND KEY MAKING IN 1568

One invention of which we have heard very little so far is the vise. The first notice of this tool seems to come from the previous century, but in Amman's time it was evidently in common use, for he pictures it as employed by the locksmith, cutler, spurrier, and other metal workers. The file seems to have been another very useful tool, as it is pictured in many of the shops. It is rather interesting to note that the locksmith seems to be cutting and punching out his wares with tools similar to those of our present blacksmith. This picture is shown in Fig. 29. Perhaps the most important addition to our knowledge of shop practices, however, is Amman's picture of the hollow-ware maker shown in Fig. 30. This shows that the lathe was already applied to metal working. The large wheel at the side would seem to indicate that the lathe was run by a belt connecting with this wheel, which was turned by hand. If this is correct, it is perhaps the first picture of a belt in actual use in a shop.

An interesting sidelight on the times is the fact that one of Amman's guild masters seems to be employed exclusively in making thimbles, which he stamped out by hand.

The extreme subdivision of guilds may be judged from the fact that Amman gives separate pictures for the plain-armor maker, chain-armor maker, and helmet maker as well as for the sword maker and cutler. Still other subdivisions were the gun maker, the gun-barrel maker and the pistol maker. Horse shoes were made by one craftsman, nails by another and spurs by still another.

FIG. 30. EARLY METAL SPINNING

This minute subdivision of the guilds had its counterpart in a division of labor which tended to increase the skill applied to a particular product. This skill in craftsmanship was also increased by the system of apprenticeship by which a boy received seven years' training in a shop before he became a journeyman and was allowed to change his working place. On the other hand, since this guild was given a monopoly of its own trade, no matter how small, such minute subdivision was a barrier against extension and was destined to be broken through with the introduction of power-driven machinery and the establishment of larger shops.

There is no doubt that the illustrations of Jost Amman marked, in general, the greatest development of the hand trades, because from this time we find more illustrations of machines as applied to industry. Curious old books devoted entirely to machinery have been found. One good illustration of the growing use of machinery is given by the engraving by Stradanus, dated about 1570, which was reproduced in the article on "Ancient Helmet Making." In this engraving a number of grindstones were shown mounted

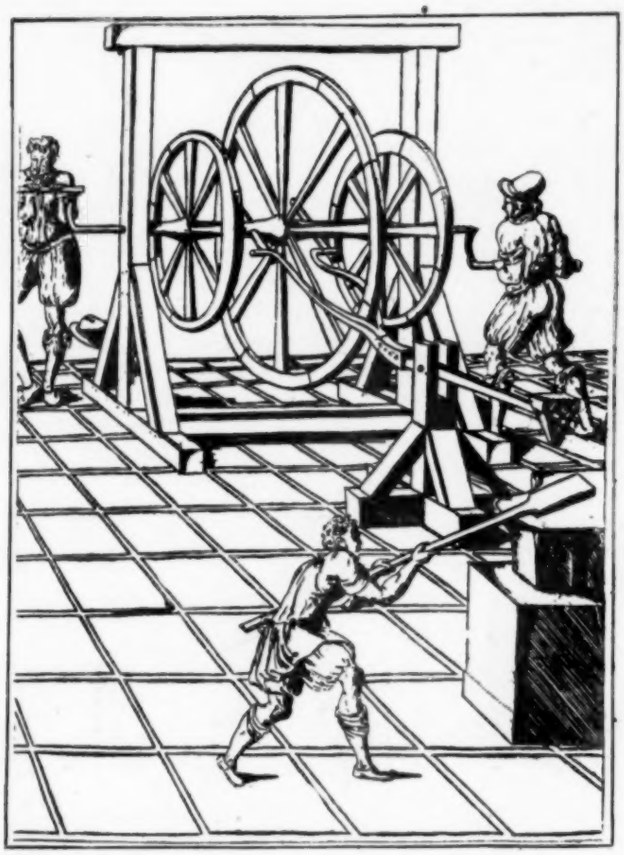


FIG. 31. A TRIP HAMMER OPERATED BY HAND POWER

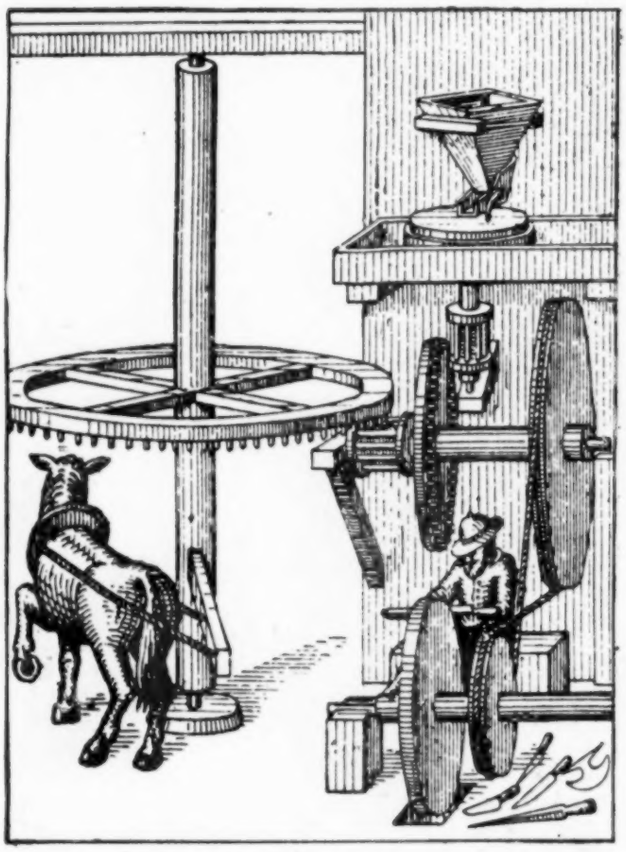


FIG. 32. AN INTERESTING INSTALLATION OF A HORSE POWER, LANTERN PINION AND ROPE DRIVE

on one shaft which was turned by a lantern pinion. This picture may be found on page 507, Vol. 49, of *American Machinist.*

What may be considered as the first printed book on the subject of machine tools was written by Jaques Bessen, and published in 1578. It was entitled "Theatrum Instrumentorium," or Theater of Mechanics, a title which was later employed for a number of such books.

In a way, Bessen's book covers an intermediate step between hand and machine work, for in it the majority of machines depicted are run by foot power or hand power. The foot power was usually applied by means of a treadle, while hand machines were driven from a flywheel that was turned with a crank.

Fig. 31 shows an application of the flywheel and crank for operating a trip hammer.

An interesting picture is found in the work of Jacob De Strada, who died about 1588. The illustration, Fig. 32, shows a grindstone and a mill driven through the medium of a rope belt and a system of lantern pinions, the whole being operated by a horse power.

A book of the engineer, Ramelli, "Del Artificiose Machine," which was published in 1588, includes many machines for engineering purposes, but only a few were applicable to shop work. These machines represent the application of water power to sawing and bellows blowing. In addition Ramelli's work shows many details which would be of interest in a more complete survey. Among these are heavy pliers and wrenches, a machine turned on roller bearings, and various sorts of gears and valves.

To sum up roughly for the century, it may be seen that power machinery was practically applied in the metal industry to boring, to wire- and bar-drawing, hammering and probably the turning and cutting of the softer metals. A more rapid development of power-driven machine tools was to take place in the next century.

Elements of Gage Making

Referring to the article under the above title in the *American Machinist*, Vol. 51, page 1033, the author recommends a flux for soldering steel composed of chloride of zinc, glycerine and alcohol, but fails to give the proportions of each.

He says that alcohol and glycerine in equal parts are to be mixed with chloride of zinc. How much chloride of zinc? Then he says, "Enough alcohol should be left in the bottle to make a clear flowing mixture." That would seem to indicate that after the chloride of zinc has been dissolved more alcohol should be added.

I think for the benefit of your readers who may decide to try the flux in question, the composition should be more clearly defined. J. R. WEMLINGER.

The flux referred to should be a super-saturated solution of chloride of zinc in glycerine and enough of the chloride should be added from time to time to insure the formation of a deposit at the bottom of the bottle after standing.

Sufficient alcohol should be added to make the solution flow readily, and alcohol should be added occasionally to replace the loss by evaporation. The mixture should be shaken well and often.

The alcohol referred to is grain alcohol. I have had no experience with wood alcohol. C. A. MACREADY.

FIG. 1. A HOLLAND MACHINE SHOP

FIG. 2. THE FOUNDRY

Business Conditions in Europe

BY GEORGE R. WOODS
Manager New York Office, R. S. Stokvis & Zonen

The deductions in this article are from the careful observation of one closely connected with the machine-tool business in the principal countries of Europe. They deal particularly with the conditions which affect this industry and which are likely to play an important part in our future foreign-trade dealings.

IN Holland, Belgium, France and England, manufacturers, well aware of the opportunities before them, are desirous of quickly seizing the chance to resume or to enlarge their business, and are in nearly all cases thinking of the future instead of complaining of their present condition or of discussing a newer and better order of things generally. In each of these countries there are impediments, interferences, and difficulties of various kinds which retard business, but in general the business men are eager and anxious to see commerce functioning more smoothly.

SHIPBUILDING IN HOLLAND

In Holland there is exceptional activity in shipbuilding, ranging from the small yards where 100-ft. to 200-ft. steel barges are being made almost as a household industry, up to the new large shipyards where 10,000-ton steamers are seen on the ways. Fairly large ships are built in the interior and brought down through the canals, which, in fact, limit their size.

Locomotive and railroad shops of all kinds, both government and privately owned, are exceedingly busy, and the manufacturing of articles in general is quite active. There is a shortage of many things which people would like, ranging from bicycles, motor-cycles, and automobiles, up to houses in which to live. The automobile situation is somewhat different from the other countries, from the fact that Holland has no special automobile industry as we know it in America.

Holland has however some interesting industries, one of the most attractive shops being shown in Figs. 1, 2 and 3, which show the Automatic Screw Works at Nymegen. Fig. 1 is the end of the main works with the office at the left. Fig. 2 is the brass foundry, where faucets and similar parts are cast, while Fig. 3 gives an end view of the foundry, which is very different from the average foundry building in the United States. Fig. 4 shows the workmen's homes, located near the brass foundry.

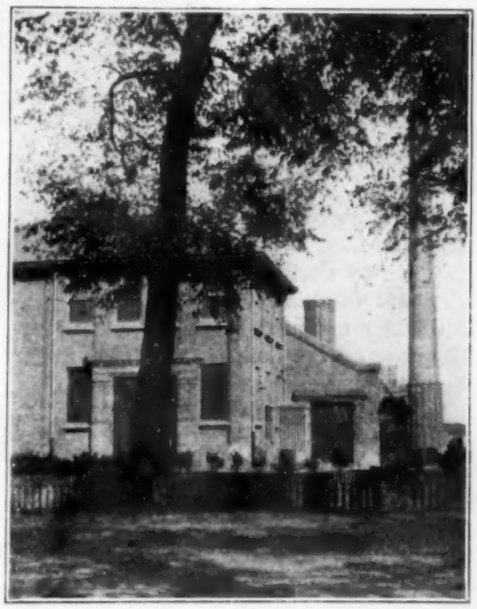


FIG. 3. END VIEW OF FOUNDRY

The large number of German and Scandinavian machine tools shipped to Holland during the war, the large stocks of these tools that are being sold there now, the low value of the German mark, and the shortage of skilled labor, are all factors which count against the sale of American products. Large machine tools, particularly, are being bought freely in Germany because of the long deliveries from America and the low value of the German mark. The American machine tools which sell best now are those which are highly developed and made by well-established American firms with an international reputation.

DANGER OF FUEL SHORTAGE

Holland is ambitious for a greater share of the world's trade, is desirous of being more self-contained economically and is looking forward to prosperous times. The shortage of fuel is the principal danger which threatens to diminish the nation's business.

The industrial leaders of Belgium are taking the same courageous attitude that the Belgium army took throughout the war. Nowhere is there any depression or bewailing of present conditions, even though manufacturers realize that they can never be compensated for their losses. After viewing the destruction in some of the large plants and learning the amount of indemnity that has been awarded, one soon realizes that the amount to be received by these manufacturers will be only nominal compensation for their losses.

The building shown in Fig. 5 is the Charleroi Electric Works, Charleroi, Belgium, the equipment of which

FIG. 4. WORKMEN'S HOUSES

was used by the Germans during the war. Nearly all of the original equipment has been returned and is now in service. Figs. 6 and 7 are groups of machine tools in the shop of Carrel Freres in Ghent, Belgium, which have just been received from Germany. This firm manufactures Diesel engines and similar machinery.

Probably the largest and most modern machine-manufacturing plant in Belgium is that of the Fabrique Nacional de Armes de Guerre, at Herstal, Belgium. Fig. 8 shows the entrance to this plant and gives some idea of its size and construction. This plant is now gradually resuming operations, using some tools returned from Germany and others that have been purchased new from various sources.

The largest automobile plant which makes the best-known Belgian automobile is the Minerva Automobile Works at Antwerp. Some idea of this is shown in Fig. 9, which is typical of the construction of all the buildings of this plant. Its product is entirely passenger cars, and American machine tools predominate throughout the plant. New tools are being bought and are replacing those taken by the Germans.

There is no reluctance anywhere toward purchasing machinery or equipment from Germany. In fact, in one of the largest enterprises, the officials stated that the low value of the German mark, the greater familiarity which the Belgian workmen had with German materials, the long American deliveries, the premium on the dollar, and the high ocean freight rates, all combined to bring them to the conclusion that they would furnish their plant entirely with German equipment.

One discouraging feature of the situation is the necessity which forces many Belgium firms to again install old and in many cases obsolete machines which were removed to Germany and which are now being returned

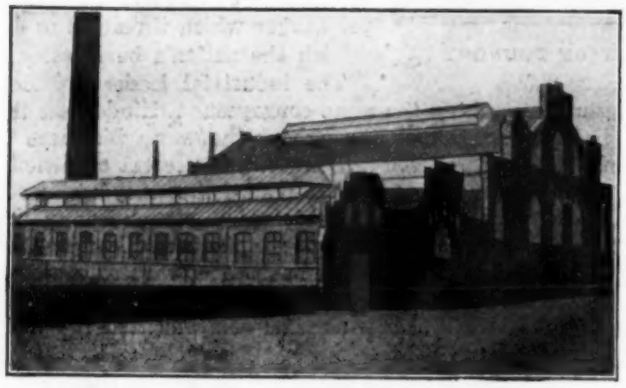


FIG. 5. CHARLEROI ELECTRIC WORKS

in wretched condition. So great is the necessity for starting the factories at once that even these old machines, now badly rusted and in frightful condition, are being cleaned up and put back on the old foundations. Under these conditions, the production per hour will be about the same as ten or fifteen years ago. No one can visit a dozen or more plants in Belgium without being amazed at the energy, resourcefulness and progressive attitude of the managers and executives. There is much to be done in the rebuilding of the railroads and their re-equipment. At the present time much of the equipment, both cars and locomotives, is of German make.

Belgium has made up her mind to re-establish herself quickly and in better shape than ever before, and is now carrying out her resolution to the best of her ability.

FRANCE

An observer who has only a limited amount of time in which to survey conditions in France, even though making a tour of the important cities, is apt to conclude that France's problem is more complex than that of Belgium and possibly that of England. A readjustment of the national economic program seems to be in the air. The restoration and rehabilitation of Alsace-

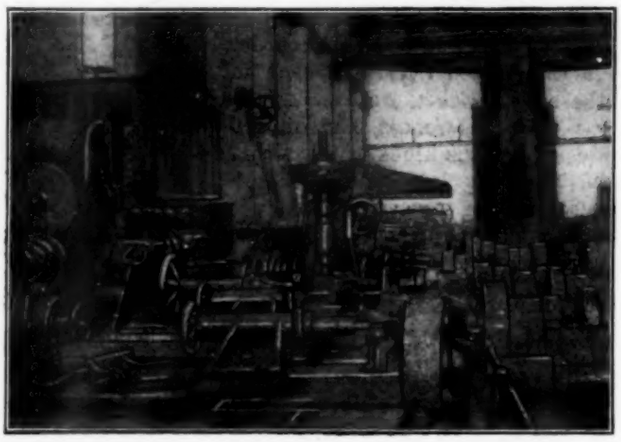


FIG. 6. MACHINES RETURNED FROM GERMANY

Lorraine, the increase in certain industries, the decrease and almost total destruction of others, is a tremendous load for any nation.

Here, too, the railways, as well as the national highways, are in need of much attention in the way of repairs and re-equipment. American locomotives and rolling stock are being used to some extent. There is a decided attempt to put the automobile industry on a firm foundation and on a quantity-production basis, which means something of a reorganization of both plants and personnel.

Throughout France there is abundant evidence of the industrial disturbance caused by the war. As in Belgium, the transportation problem is probably the most serious. Not only is there a shortage of railroad equipment, but the whole transportation system of France seems to be out of balance. A tremendous amount of war material is still clogging the ports. At Havre, for example, some of the largest piers are still filled with British army stores and machine tools. General cargoes are often unloaded over the shipside to the lighters and then towed around the harbor and up the Seine

until some empty place can be found where the cases may be unloaded and often remain in some out-of-the-way place for months. In several instances, brand-new expensive American machines were almost hopelessly covered with rust. The cases were smashed because of the severe handling and the outdoor storage did the rest. Contrasting France and Belgium, it seems as though Belgium has already determined her economic position and is working out her salvation. In France it seems as though there was considerable uncertainty as to what course to pursue.

The transportation difficulties, the premium on the dollar, and the low price of the franc, all impede the sale of American machine tools. There is considerable dealing in second-hand tools, and the gravest point of all is the direct recommendation of the government to purchase everything possible in Germany and as little as may be in England and the United States. A speech to this effect in the Chamber of Deputies was applauded. The officials appeal to the business men of France not

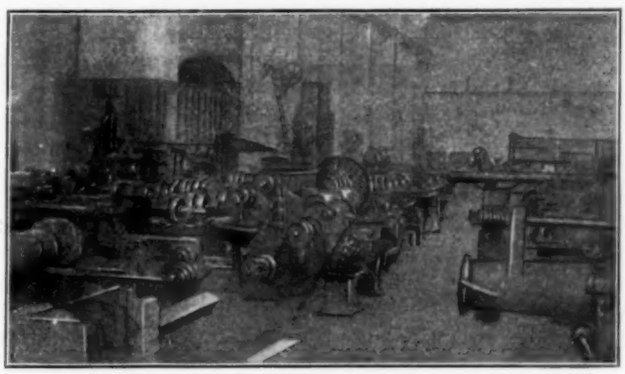


FIG. 7. MACHINES RETURNED FROM GERMANY

to let their prejudices interfere with their business judgment, and urge them to purchase everything possible in Germany because of the low value of the German mark.

England

The question of transportation in all its branches is the dominant issue in England as in almost all European countries. In England the government still has some of the most important piers and tidewater warehouses filled with army stores.

The whole industrial life of Britain has been, of course, most seriously disturbed; and their desire to rebuild England on a better basis than ever before, and at the same time to "carry on," is slowing up their recovery. They are trying to build a new house and live in it at the same time. In their eagerness to protect key industries, they propose to prevent importation of precision instruments such as micrometers, etc., claiming that England should not depend on other countries for tools which were needed for the national defense. Programs such as these in the case of a very critical and delicate situation, are interfering with the quick recovery of Britain's industry.

Then, too, there is the natural reaction from five years of being very close to a great war. There is a great demand for automobiles, motor-cycles and motor trucks, in spite of the high price of motor fuels. In none of these lines is it possible to secure prompt deliveries in many cases. The general unrest is, of course, partly responsible for this condition.

FIG. 8. A BELGIAN FACTORY

The means for overcoming the disadvantages under which American exporters operate today have been discussed almost daily in the public press. There appears to be a full realization here of the seriousness of the situation, as well as a desire and an ability to meet it. The impatient attitude of European buyers and their apparent unreasonable demands can possibly be better understood if one considers France, Belgium and England as countries in which every industry and every business has experienced a fire or an earthquake.

All Organizations Are Upset

Practically every organization is upset and disorganized, and in this condition, with strikes of all kinds pending from week to week, the business men of Europe are trying to rebuild their organizations. Nowhere do you find conditions normal, and it is in a disturbed unsettled and abnormal atmosphere that the agent of the American exporter is endeavoring to sell American products

As the price of German tools descends, the greater is the possible number of buyers for them. There are, however, many firms in Europe who would still buy

FIG. 9. MINERVA AUTOMOBILE WORKS

American machine tools, even if tools of German make were given to them. And when European buyers display confidence of this nature in American tools, it is a sign of encouragement that warrants American manufacturers in bearing with their European customers in this, the most trying period of European history.

Modern Aviation Engines—I

By K. H. CONDIT
Managing Editor, *American Machinist*

THE development of aviation engines during the last three years has been so startling that a series of sketches of the representative types used by the various air services of the Allies and the Central Powers, as well as some of the recent commercial types, has been prepared in an attempt to place the present situation before the readers of the *American Machinist*. Six pages of these sketches are planned, each to be accompanied by a brief description of the models shown.

No attempt has been made to group the engines according to types except that those with radially arranged cylinders, both stationary and revolving, appear in the same group. The classification of airplane engines can be attacked in so many different ways that it is rather difficult to choose the best one. All of the models shown are of the four-stroke-cycle type. Two-stroke-cycle airplane engines have been built and operated but never with entirely satisfactory results. The air-cooled cylinder is also out of favor just now except for rotary engines where its use is imperative because of the difficulties attendant upon the adaptation of water cooling to rapidly revolving cylinders, and in some of the smaller fixed radial engines.

When the art of flying was in its infancy, the internal-combustion engine had not progressed much beyond the "short-pants" stage and the only reliable power plants were of the four-cylinder vertical variety. Compared with present practice they were heavy, but as they were the best to be had they were used to a certain extent. Several engines of this type were constructed with air-cooled cylinders at an appreciable saving of weight, but about the only valuable feature of these early vertical engines was their economy in fuel consumption.

The rapid advances in the automobile-engine field were reflected in aircraft engines so that at the outbreak of the war there were several reliable and reasonably light vertical water-cooled engines available. Engines of this type are built with four, six and eight cylinders, but by far the greatest number are sixes. One of the latest of these appears on the opposite page; built by the Hall-Scott Motor Co., it combines with their experience the proved features which made the Liberty motor so successful. Vertical engines have a high reputation for reliability, economy and long life, but their weight per horsepower is usually not much below 3.5 to 4 lb. The arrangement of the cylinders is the best possible to reduce head resistance, but of course makes them occupy a good deal of fore-and-aft space in the fuselage, particularly in the eight-cylinder type. In multiple installations this difficulty disappears.

A very few engines of the horizontal-opposed type have been built, but never with sufficiently good results to warrant their adoption, and never with high power.

In order to reduce the length of the bigger engines, the cylinders are arranged in two rows set at an included angle of 45 to 90 deg. and forming what we call the V-type engine. Engines of this type have all the advantages of the vertical engines except the low head resistance, and in addition are characterized by a much lower weight per horsepower. This figure will be approximately 2 lb. for the modern V-type motor. The reduction in length of crankshaft and crank case permits both to be made lighter and stronger and the possibility of locating accessories inside the V makes the design a compact one.

If reduction gearing is used between crankshaft and propeller, the latter may be raised far enough to allow a machine-gun barrel to be mounted on top of the crank case to fire through the hollow propeller hub. Several motors have been built to take the French 37-mm. cannon in this way. This is not quite so simple a problem as it sounds, because of the rapid heating of the barrel of the gun when in action and the difficulty of securing really reliable reduction gearing, but the elimination of the delicate synchronizing gear needed when the gun is to be fired through the propeller blades is a very important advantage.

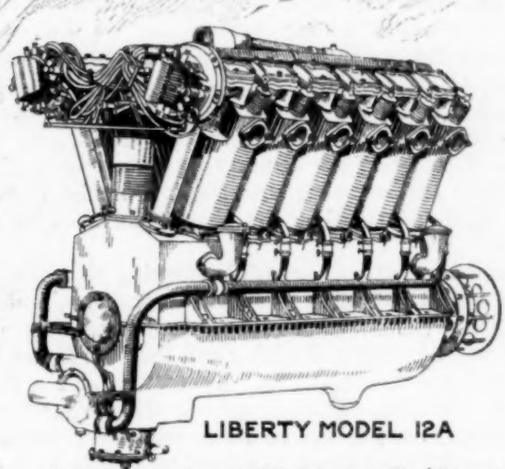
The V-type engines were the backbone of the American, British and French aviation programs as will appear in subsequent installments of this series. Our own air service soon discarded all other types except a few rotary engines for scout training machines, and used Liberty or Hispano-Suiza engines for everything except primary training where the old reliable Curtiss Model OX was unbeatable for the work required. So much has been published concerning the conception, design and manufacture of the Liberty motor both in the *American Machinist* and elsewhere that little new can be said. Built as a high-compression job for the Army and with lower compression for the Navy, it finally silenced its critics by its splendid work in the transatlantic flight of the NC-4 flying boat.

As a factor in the actual fighting on the Western front, its value was probably more potential than actual, but it is quite possible that the information supplied by the German secret-service agents to the high command concerning the rapid strides in production in this country had something to do with their sudden decision to throw up the sponge.

Shortly before the signing of the armistice, the Curtiss Co. brought out its Kirkham 12 which is shown here. It was first mounted in a small combat machine of advanced design and gave an unusual performance at the Army test fields. This motor is quite different from the standardized Liberty. It has four valves per cylinder and drives the propeller through reduction gears, the crankshaft turning at better than 2500 r.p.m. This machine recently broke the official altitude record by exceeding a height of 30,000 ft.

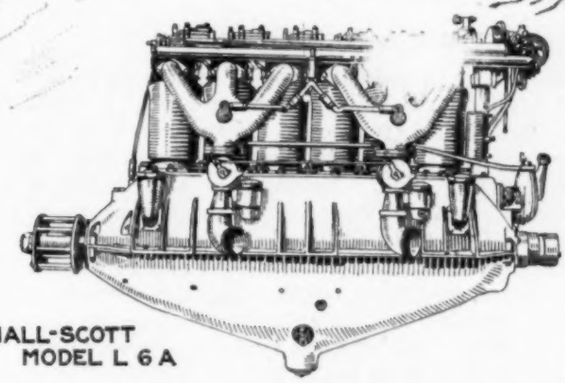
The other motor shown is the small Hispano-Suiza which is credited with having made the famous French Spad possible. In the second year of our participation in the war this motor was used in our advanced training machines with marked success. The other models will be described in more detail in the next paper of this series.

For still higher powers the cylinders have been arranged in three rows to form the W-type engine. The complications multiply to such an extent in this model, however, that it has not met with favor. The most prominent example was the 18-cylinder Sunbeam which had six magnetos, six carburetors and six camshafts. Tuning up such an engine ranks among the high arts.



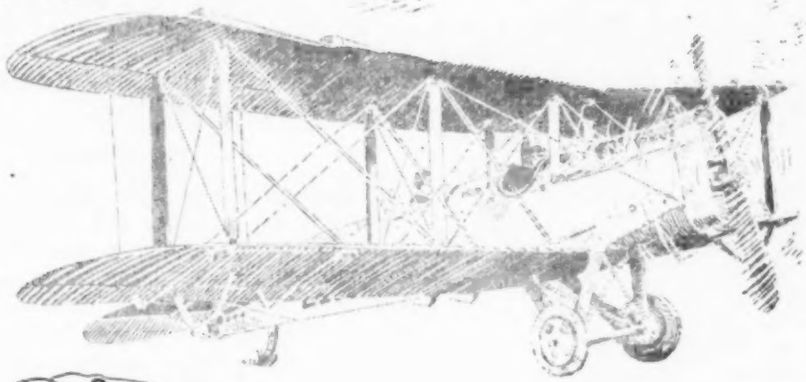
LIBERTY MODEL 12A

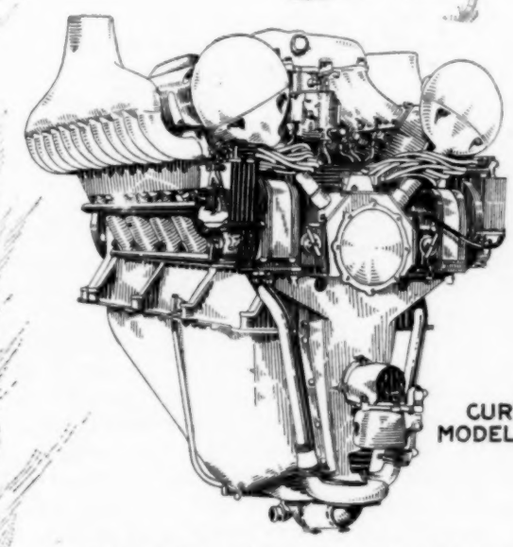
Twelve cylinders; bore, 5 in. (127 mm.); stroke, 7 in. (178 mm.); compression ratio, 5.4 to 1 (Army type), 5 to 1 (Navy type); angle between blocks, 45 deg; rated hp., 410 (Army type), 330 (Navy type), at 1750 r.p.m.; generator battery ignition; dry weight per hp., 2.11 lb.; fuel consumption, 0.51 lb. per b. hp.-hr.



HALL-SCOTT MODEL L 6 A

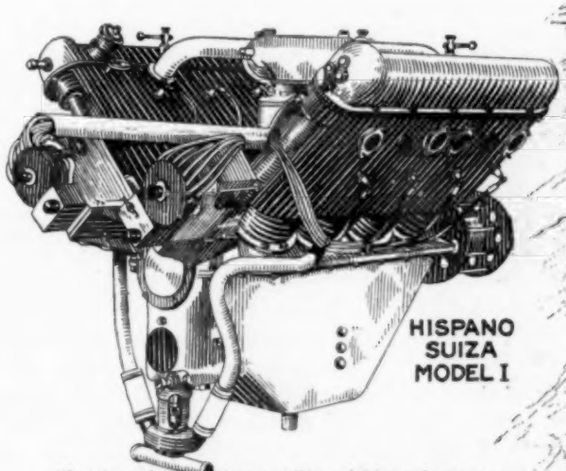
Six cylinders; bore, 5-½ in. (127 mm.); stroke, 7 in. (178 mm.); compression ratio, 5.5 to 1; rated hp. 200 at 1700 r.p.m.; generator battery ignition; dry weight per hp., 2.2 lb.; fuel consumption, 0.55 lb. per b. hp.-hr.





CURTIS MODEL K-12

Twelve cylinder; bore, 4-½ in. (114 mm.); stroke, 6 in. (152 mm.); compression ratio, 6 to 1; angle between blocks, 60 deg.; rated hp., 400 at 2330 r.p.m.; two-spark magneto ignition; dry weight per hp., 1.65 lb.; fuel consumption, 0.55 lb. per b. hp-hr.



HISPANO SUIZA MODEL I

Eight cylinders; bore, 4.72 in. (120 mm.); stroke, 5.12 in. (130 mm.); compression ratio, 4.8 to 1; angle between blocks, 90 deg.; rated hp., 150 at 1450 r.p.m.; magneto ignition; dry weight per hp., 3.03 lb.; fuel consumption, 0.51 lb. per b. hp.-hr.

-by B Z REITER-

There is some question whether it is advisable to put so much power into one unit, and for fighting work where one bullet can put an engine out of action, the tendency is toward increasing the number of engines rather than the power.

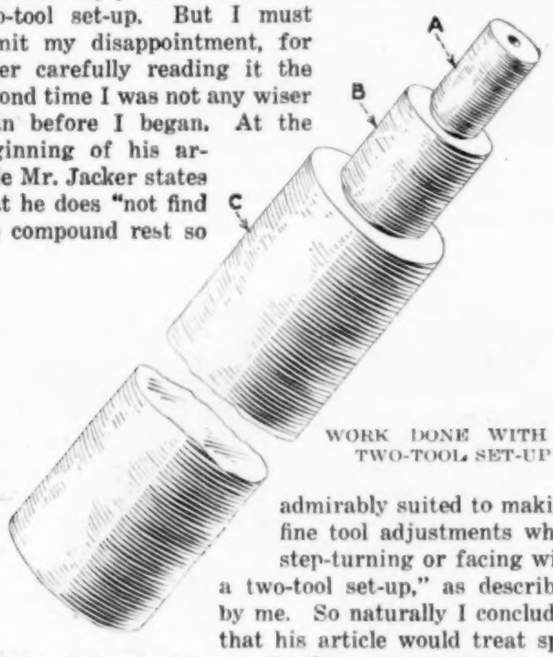
Radially Arranged Cylinders

The final step in reducing engine length is to arrange the cylinders radially like the spokes of a wheel about a drum-shaped crank case. Here the weight per horsepower is very low but the head resistance becomes disproportionately high. Economy is also sacrificed to a certain extent. Two possibilities present themselves in this type of engine; to keep the cylinders stationary as in the other types described and rotate the crankshaft and propeller, or to make the crankshaft the fixed part and let the cylinders and crank case revolve about it. Both of these types are shown in the fourth installment of the series and the peculiarities of their action will be taken up at that time.

Using Two Tools at Once

By H. F. Pusep

When looking over the *American Machinist* I read an article on page 731, Vol. 51, by M. Jacker, criticising the method of the two-tool set-up described by me in an earlier issue. This interested me greatly, and I hoped to enjoy the article and to learn more about the two-tool set-up. But I must admit my disappointment, for after carefully reading it the second time I was not any wiser than before I began. At the beginning of his article Mr. Jacker states that he does "not find the compound rest so admirably suited to making fine tool adjustments when step-turning or facing with a two-tool set-up," as described by me. So naturally I concluded that his article would treat specifically of these subjects. On the contrary, these issues do not appear, but instead a rather elementary treatise on effects of heavy cuts in reproducing inequalities of "rough forgings in miniature upon the finished product." I might say here that the two-tool set-up described by me was not intended as a cure-all for existing mechanical troubles. Mr. Jacker will understand my meaning better if he will try to reduce a hexagon bar of steel in one cut on the sturdiest built lathe on the market.



WORK DONE WITH A TWO-TOOL SET-UP

The average machinist who "sometimes uses a piece of pipe on the wrench" would not be tolerated by any foreman who values his lathe equipment. The toolpost wrenches supplied by the lathe manufacturers are the proper means wherewith to tighten a tool, and if they are not effective I would advise using a heavier lathe rather than ruin the toolpost via the "pipe on the wrench route" as described by Mr. Jacker.

Just why the compound rest is not suitable to making fine tool adjustments is not explained, the nearest to explanation being the assertion that it "would require the tapping of the compound rest from side to side with a piece of lead." This, however, is unnecessary if the swivel nuts are loosened; but should it persist in sticking I would advise that the shop repairman be consulted.

A number of years ago, while working as a journeyman machinist, a large number of shafts similar to the inclosed sketch were being put through the shop. Part *A* was afterward threaded and the part *B* was held to a tolerance of ± 0.002 in. There was also a recess at each shoulder. Several men besides myself were working on this job and as there was a sort of bonus system in the shop, the competition was quite keen. As it was a case of "more production, bigger pay" I did some hard thinking, the result of which was that my bonus averaged about 75 per cent higher by the end of the week than that of the next highest lathe operator. A spare toolpost which I found in the tool crib gave me the idea of a two-tool set-up. Of course, this good luck didn't last very long because the boys got wise to the trick and then the time setter had to set a new rate to suit changing conditions.

The Operations

The operations of these pieces which were made of bar stock, cut to length and centered, were as follows: Diameter *C*, not requiring close limit, was finished in one cut, the operator fixing a dog on a new piece while the lathe was running. This method was followed throughout, performing the same operation on several hundred pieces before changing on to the next one. The diameter *B* was now roughed out in the usual way, leaving enough stock for the final finishing; diameter *A* being then roughed out identically to *B*. The operation following consisted of finish-turning the diameters *A* and *B*, using two tools at once (such a set-up was explained in my previous article).

This operation left radii at the shoulders and so the next operation squared the shoulders at the right distance from the end of the shaft and formed the recess at each shoulder, this being accomplished with a regular cutting-off tool.

It will at once be apparent from the accompanying sketch that if the important diameters *A* and *B* could be finish-turned in the time that it previously took to turn one of them, the saving of time on several hundred pieces would be very considerable. This can be accomplished on any ordinary engine lathe by the aid of the compound-rest swivel. There might be other methods whereby the same results can be obtained without any additional expensive equipment to the standard lathe, but if there are, they have not come to my notice.

In conclusion I agree with Mr. Jacker that there is a certain amount of "maneuvering" as he calls it in setting up the two tools, but then even a most simple set-up requires it more or less. It is my opinion that if the results attained more than justify the small initial time spent in setting up for a given job by a new method, it should be adopted until somebody shows a better way—for by so doing the wheels of progress are kept going in the right direction.

Making or Manufacturing?

By E. A. DIXIE

In spite of our boast that we are the greatest manufacturing nation in the world, there is still an enormous amount of "making" as opposed to "manufacturing" even in some of our largest so-called manufactories. There is generally more evidence of this form of inefficiency in long-established plants than there is in the newer ones. The handling of work in jigs and fixtures which hold a number of pieces at a time does not necessarily mean that the work is handled faster than it might be in a simpler jig or fixture which holds but one piece.

SEVERAL years ago a young friend of mine took a job as general superintendent of a large small-arms factory.

He is an exceptionally good man, but was handicapped because he had spent practically all his working life in one shop, and so had not the breadth of experience that drifters acquire in their wanderings.

In the new shop, the men, the tools and the methods were all old; in fact, everything was old except his job, while in the previous shop he had been accustomed to conditions exactly the reverse.

About two weeks after he started I got into town and at once called him on the phone to ask how he liked the new position. Instead of a cheery invitation to see some new trick whereby work was turned out faster than it had ever before been turned out, in a mournful voice he begged me to come down to the shop for half an hour to talk things over, as he was at his wits' end with the new conditions and needed council and advice.

When I got there he had the same expression on his face that I once saw on the face of a man who fell overboard in Sydney Harbor—ask any old sailor man about the sharks in Sydney Harbor, but don't believe anything over 20 ft. He was the picture of despair.

In response to my query as to what was the trouble, he began about as follows:

"Dixie, I'm here to increase production and I don't know where to start. There's not a machine tool in the shop that did not come over in the Mayflower. Whenever I ask for new tools, the boss calls in an antiquarian who has worked here for centuries and has the histories of all the machines tucked away in his head. He knows just what the boss wants him to say so he tells me what fine-paying work was done on the old chain lathe during the war. No! not the Civil War, but the war of 1812. Then he goes on to say that modern tools are no good and to support this statement he tells how the firm bought a new lathe in 1856 which was no good and had to be sold at a loss. Then the boss butts in with the intimation that, father and grandfather always said the shop was the best equipped in the world, and that what is wanted is product and not bills for new equipment. But come out into the shop and see what I'm up against.

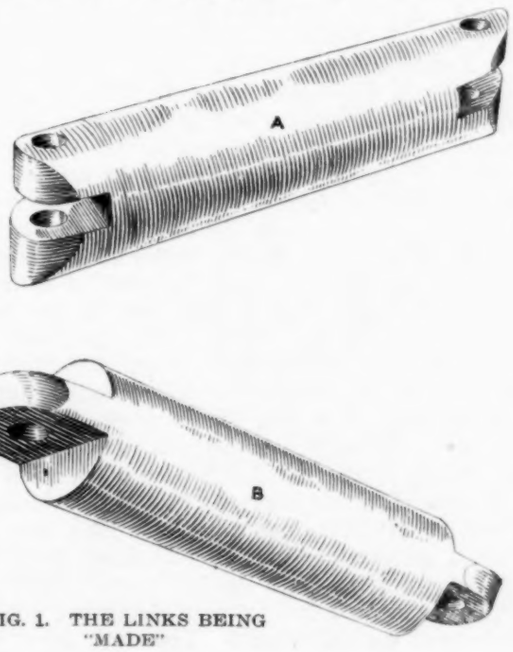


FIG. 1. THE LINKS BEING "MADE"

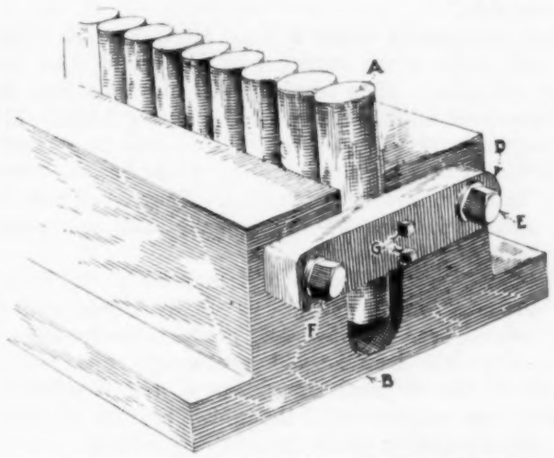


FIG. 2. JIG FOR "MAKING" THE ENDS ROUND

"Just look at that frame-milling job. The spindle of the machine is running so slow that unless you chalk one of the teeth of the cutter you can't tell whether it is turning right or left. You are familiar with the last shop I had charge of; pick out any job here and compare the machines and methods with those for the same job in the other shop."

Fixtures Needed, Not Machines

So I went from job to job and looked things over and the more I looked the more I was convinced that the frame-milling job to which he had called my attention was a typical example of the way work was done in the shop. But the trouble was not with the machines so much as it was with the jigs and fixtures. The more I saw of the jigs and fixtures, the better satisfied I was that he had nothing to worry about, providing the firm would be willing to spend money on accesssories rather than tools. So I asked him the attitude of the firm toward the making of jigs and fixtures; to which he replied that he had a free hand so far as these were concerned, no matter what they cost, because no bills were rendered for them from outside concerns.

"Then," said I, "I don't see what you want with my sympathy. The trouble is not with the power of the machines; it is with the weakness and unhandiness of the fixtures. You tell me you are here to make a record; that you've got to live up to the record you made in the former shop as a producer, and that you can't see your way to do it because the machines, methods and men here are all antiques. Your viewpoint is wrong. You might have something to fuss about if all the machines, methods and men here were up to date and they had in actual operation one of those faultless systems which are found only in books on efficiency. But here with this outfit anything you do will be an improvement; you can't go wrong, a mistake is impossible."

I saw him again about a year later, he had made good and he gave me some credit for giving him the proper viewpoint. The trouble with him was that he was impressed with the size of the new concern. He had been accustomed to manufacturing and he thought the new shop was a manufacturing plant because they said so in their advertising matter. They were *makers* —not *manufacturers*. There are many such, producing many lines of machinery.

Recently, I was called into such a shop "to lower their manufacturing costs," as their letter stated. After looking over the plant and product, the treasurer, a very dignified ladylike old gentleman, who looked like one of the original Daughters of the Revolution, asked me very seriously if I thought it possible to lower their manufacturing costs; to which, I replied:

"No one can lower your manufacturing costs, you have no manufacturing costs; you are not manufacturing, you are merely making. But if you will permit some small changes and order some little jigs and fixtures to be made in the shop (that's what gets them, *made in the shop*), I believe in many instances your output can be doubled, without increasing the payroll."

As the firm is still somewhat sensitive because of what was said about their methods, only one item of their manufacture will be shown as an example of how easy it often is to lower costs of production by the use of suitable jigs.

In Fig. 1, at *A* and *B*, are shown a female and male

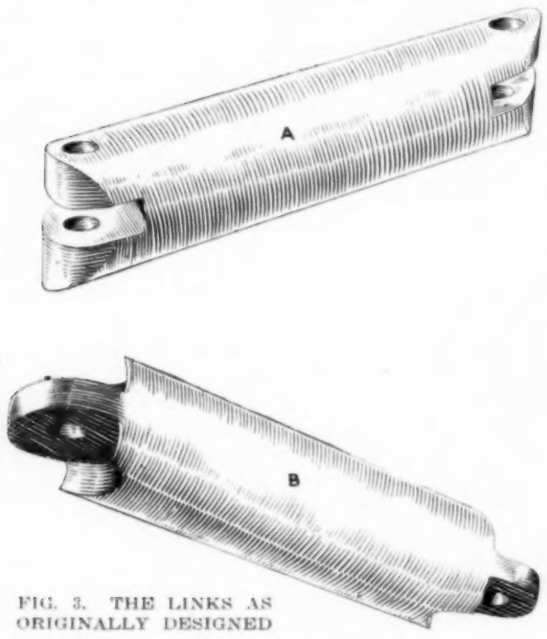


FIG. 3. THE LINKS AS ORIGINALLY DESIGNED

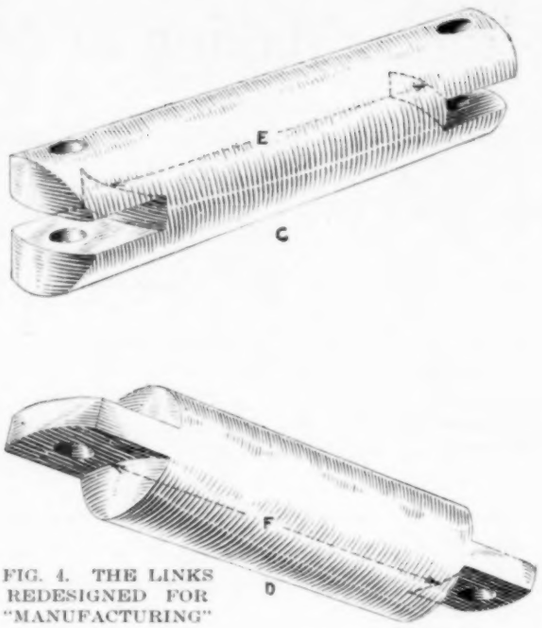


FIG. 4. THE LINKS REDESIGNED FOR "MANUFACTURING"

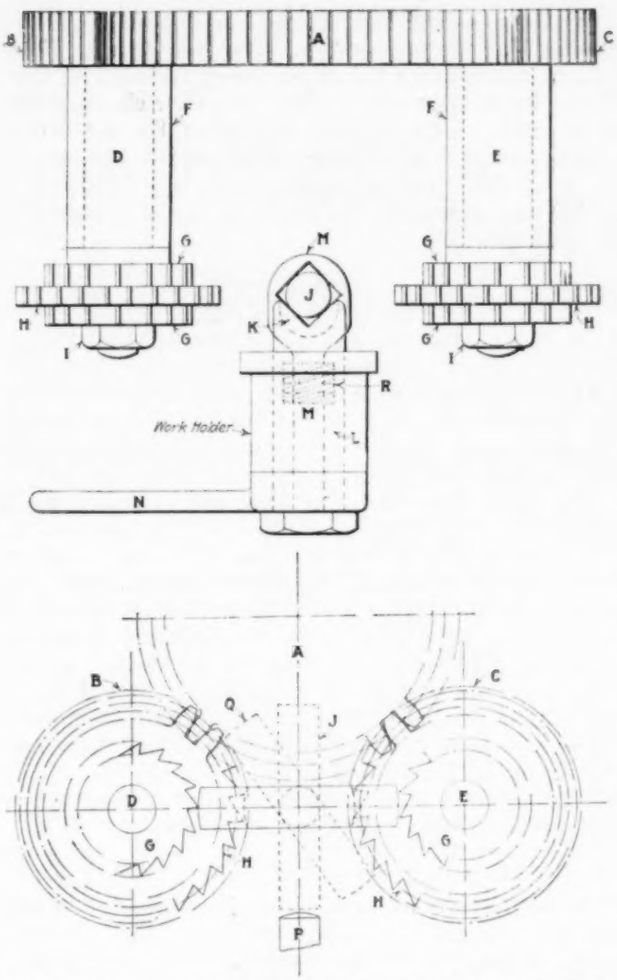
link of a sort of link belt used in one of the machines made by this concern.

Sizing Up the Job

The stock is round cold-rolled steel ⅞ in. in diameter. Over all, the links measure 3¾ in., and the center to center distance of the pin holes is 3 in. Many thousands of these links are required. Before suggesting a manufacturing method, I saw the link belt in operation and noted that the ½-in. pins in the holes in the ends were required to carry all the load the links were called upon to carry; also that they were quite strong enough for this duty. I also noted that when in action the links were never inclined more than about 10 deg. from the contiguous links. I had previously watched the method of manufacture which was as follows:

A number of bars of stock were held in the vise of a cold sawing machine and cut to length. The next job was to mill the circular ends. For this the blanks *A* were held in a jig *B*, Fig. 2. The jig *B* is made of cast iron. A ½-in. slot with a half-round bottom runs from end to end. One end of the slot is permanently closed by a plate fastened with capscrews. The other end is provided with a swinging plate *D*, which pivots on the capscrew *E* and has a slot at the other end for the capscrew *F*. Why the designer of this jig pivoted the plate *D*, I can not see, as the blanks are not put in from the end but from the top. Two setscrews *G* in the plate *D* serve to clamp the blanks when they are located. The jig holds 20 blanks. After a large number of blanks are rounded on one end, the work of rounding the other end begins, and so does trouble, for there is nothing nicer for the retention of chips than that deep ½-in. slot with its rounded bottom. It only takes one little chip to raise one of the blanks enough to cause it to be spoiled. It is also almost impossible to tell whether the previously rounded end of the blank is seated properly in the rounded bottom of the slot.

The trouble with this fixture is that at first glance it looks like a real fixture and when the office man sees it he thinks the operator is milling 20 pieces every time the milling cutter traverses the full length of the vise. As a matter of fact, it is a rank deception, spoiling as much work as it produces. The work from it is



FIGS. 5 AND 6. ONE OF THE NEW "MANUFACTURING" MILLING FIXTURES

never perfect, the rounded ends are never aligned; and, as the rounded ends serve as locating surfaces for the subsequent operations of drilling the holes, slotting the ends of the female links and milling the tongues of the male links, the holes, slots and tongues are never in perfect alignment.

As the fixtures for milling the slots and tongues, and the drilling jigs for the holes, produced nearly as much scrap as they did passable work, there is nothing to learn from their construction, except what to avoid. They will, therefore, not be shown.

With a knowledge of the duty of the links and how they were made I went to the chief draftsman, who, by the way, was responsible for the design of the links.

From him I elicited the fact that *originally* he designed the joint of the links to take the *thrust* of the load, but, as the link chain is in *tension*, I could hardly see the use of a *thrust* joint. As first designed, they were like Fig. 3; that is to say, somewhat similar to the hinge joint of a "break down" revolver. He said that they had found it impossible to manufacture them in this form, so, as it was the most difficult to make, they changed the female link first to that shown in Fig. 1, at *A*. Then, because of the breakage of counterbores, they changed the male joint to that shown at *B*, Fig. 1. However, while it was of no specific use, they still retained the $\frac{3}{8}$-in. radius on the rounded ends.

With this information I sketched the links shown in Fig. 4, at *C* and *D*. In these links the over-all length and the center to center distance of the pin holes are the same as in the links shown in Fig. 1, but the lengths *E* and *F* are slightly shorter, for clearance, than similar dimensions in Fig. 1.

Balking at "Looks"

When the sketch was completed, it was shown to the chief draftsman for his approval. After fussing around for a couple of hours (during which, unknown to him, the sketches for the manufacturing fixtures were started), all he could find to say against it was: "It does not *look* as good as the original link." He stuck to this objection even after his attention was called to the sheet-steel guard which entirely obscures the link chain in the completed machine.

The new manufacturing fixtures were made as attachments to several old 14-in. lathes which had outlived their usefulness as lathes.

The milling and drilling fixtures were designed first, as the old method of cutting off the bars in the cold saw was for the time being quite good enough. Later on, however, the blanks were sheared off one at a time at the rate of 30 to 40 per minute, there being no objection to the slight change of form at the ends of the blanks due to this method of making them.

The milling fixture is shown in Figs. 5, 6 and 7. The gear *A* is fastened to a faceplate which is screwed on the spindle nose of the lathe. It engages with the two gears *B* and *C*, which are similar in size, and secured to the ends of the spindles *D* and *E*. These spindles run in bearings, mounted in the bracket *F*, secured to the lathe bed, and are so arranged that they can be adjusted to or from each other to compensate for change of size of the milling cutters due to wear and grinding.

By using gears with teeth of very coarse pitch and mounting the driven gears so far below the center of the driving gear considerable latitude of adjustment was obtained without complicating the fixture with universal joints, flexible shafts or other contraptions.

The other ends of the spindles *D* and *E* are provided with gangs of milling cutters *G* and *H* held by the nuts *I*.

The work *J* is seated in a V-block *K*, which is formed on the outer end of the work-holding spindle *L*. This spindle is hollow for the reception of the stem of the yoke *M*. The center of the V-block *K* is cut away for the yoke *M*. At the other end the work-holding spindle

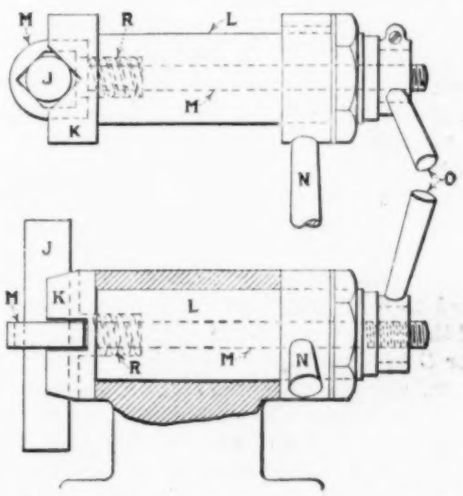


FIG. 7. DETAILS OF THE WORK HOLDER

L is provided with a handle *N*, and beyond the handle a D-washer and locknut are provided to take up wear and end movement.

The end of the work-holding spindle, Fig. 7, projects beyond the locknut sufficiently to afford a seat for the threaded clamping lever *O* which screws on the end of the yoke stem *M*.

In charging position the lever *N* rests on the front V of the lathe bed. A link blank from the cut-off saw is dropped down between the yoke *M* and the *V*-block *K* till it rests on the stop *P*. The yoke lever is now tightened, which draws the work *J* tight into the V-block *K*. It may be as well to mention a small detail of the work-clamping lever *O*, which saves a lot of time.

This lever consists of two parts—a plain cylindrical nut which fits into a cylindrical hole in the head of

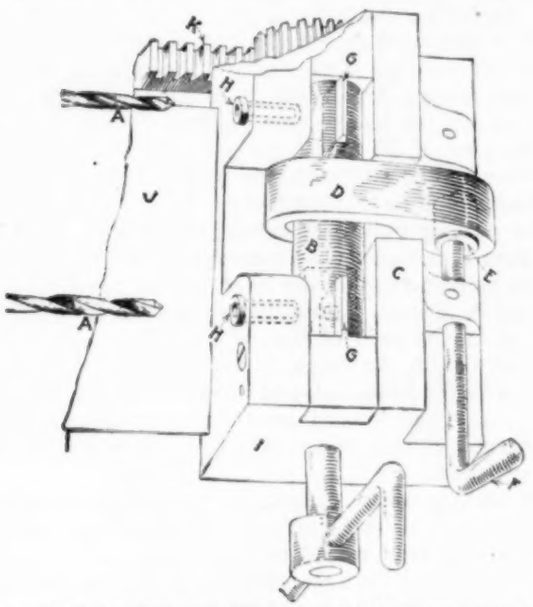


FIG. 8. ONE OF THE "MANUFACTURING" DRILLING JIGS

the lever. The head is split and provided with a clamping screw so that the cylindrical nut can be adjusted within it to clamp the work with the lever in any desired position. This feature was to provide a simple automatic release for the work after it had passed the cutters.

Duplicate Fixture

In the illustrations, Figs. 5, 6 and 7, I have shown the milling of the female links only, because the milling of the male links is done on a duplicate fixture, the only difference being in the substitution of a gang of cutters suitable for the male links.

When the work *J* is securely clamped by the lever *O*, the operator raises the handle *N*, and both ends of the link pass the gangs of cutters at the same time. When the work reaches the position shown at *Q*, the end of the clamping lever *O* comes in contact with a stop fixed to the back V of the lathe. Further movement of the lever *N* causes the stop to release the clamping lever *O* by unscrewing the threaded head from the yoke stem, and the spring *R* forces the yoke *M* into open position. This releases the work which slides by gravity out of the V and yoke and down a chute to a box on the floor. The lever *N* is now returned to starting position on the front V of the lathe and the V *K* is again ready to load with work.

In this way both ends of the link are milled simultaneously at the one setting. The stop *P* is in plain view of the operator before he places the work so that he can see if there are any chips or other obstructions. Small chips on the stop do not affect the quality or length of the work as there is an allowance of about $\frac{1}{16}$ in. at each end for milling, and the total length of the links is controlled by the distance which separates the gangs of cutters.

The Drilling Jig

The drilling jig for the female link is shown in Fig. 8. It also is mounted on a lathe. The drills *A*, Fig. 8, are driven by a geared head just the same as the one used for milling and shown in Figs. 5 and 6, with the exception that the centers are closer, and smaller gears are used; also there is no provision necessary for wear as with the milling cutters.

The work *B* seats in the V *C* and is drawn down securely by the hook clamp *D*, which is operated by the eccentric *E* and lever *F*. The slots in the ends of these links are a snug sliding fit over the hardened tool-steel guides *G*. The tops of these guides are made to a fairly sharp edge, so as to facilitate locating the work in the jig. Holes are provided in the guides, in line with the bushing holes *H*. The bottom of the part *I* has a slide formed on it to permit it to move to and fro on the base *J*, which is secured to the lathe bed. Movement of the sliding *I* and work is obtained by means of a rack *K*, secured to the base *J*, and a pinion and lever mounted in the sliding member *I*.

Some of the Other Components

Some of the other components were handled in new jigs and fixtures to greater advantage than were the links, while with others there was not so great a saving. All of the product was, however, improved and scrap due to faulty *methods* was eliminated.

The original operations on the links were: Cut off; mill round on one end; mill round on other end; slot one end; slot other end; drill one end; drill other end.

The new operations were: Cut off (in the shear this is done about 25 times as fast); mill and slot both ends simultaneously; drill both ends simultaneously.

Drawing Shells with Sharp Corners

By Gustave F. Bahr

The sketch shows a method of drawing metal shells to a sharp corner, which is quite difficult to do on some work, for the reason that there must be a good radius on the punch and die in order to keep the stock from breaking and have it draw properly.

In the first operation shown at *A*, the blank is drawn to the proper depth with a little extra crown which

DRAWING SHELLS WITH SHARP CORNERS

in the second operation is compressed back into the corner, making the latter sharp.

Care should be taken not to get too much metal in the crown, otherwise there will be too much strain on the tools and they will not stand up well. There should be just enough extra metal to fill out the corner.

US ARMY ORDNANCE NEWS

The Manufacture of Artillery Range Finders—IV

By GEO. H. THOMAS

Previous articles which have been presented dealt with the theory and use, the tools and processes, and the indexing and engraving methods employed in the manufacture of range finders. This article, the last of the series, tells of the finishing and final inspection of the instruments.

(Part III was published Feb. 5, 1920.)

AFTER the proper association of aprts in the process of assemblies have been made, the parts are ready for the applying of the protective finish. It is important that field-artillery pieces should be finished with the idea of blending the piece into the surrounding landscape, and the color scheme should be in accordance with the latest practices of camouflage. Such is the case with the dull-bronze-finished French artillery pieces which are quite interesting in the distance while the American field pieces, with their soft gray-green finish, are lost to the eye at short range.

The French Process

The chemical bronzing process, as employed by M. Schneider et Cie, Paris, produces a soft dull finish by oxidation. The process makes use of the following solutions and the method of application as hereinafter described.

Solution No. 1:

Bichloride of mercury	50 g.
Ammonium chloride	56 g.
Nitric acid at 36 deg. Baumé	16 c.c.
Alcohol at 90 deg.	100 c.c.
Water to make 1 quart	

Solution No. 2:

Perchloride of iron	60 g.
Sulphate of copper	20 g.
Nitric acid at 36 deg. Baumé	50 c.c.
Alcohol at 90 deg.	30 c.c.
Water to make 1 quart	

Solution No. 3:

Protochloride of iron	30 g.
Perchloride of iron	10 g.
Alcohol at 90 deg.	15 c.c.
Nitric acid at 36 deg.	10 c.c.
Water to make 1 quart	

The pieces are first scoured and cleaned to remove all trace of grease. After drying, they are given a brushed coat of solution No. 1 and placed on a mesh tray in a drying oven where they are left for 30 min. in a temperature of 140 deg. F. After cooling, they are placed in a sweating boiler for five min. at 112 deg. F. The sweating boiler consists of a galvanized-iron inclosure heated by vapor from a water bath located in the bottom of the boiler. After the sweating process, the parts are again placed in the drying oven until thoroughly dry. The pieces are next submerged in boiling water, after which they are dried and cleaned with steel wool and metal brushes.

The above sequence is repeated with two applications of solution No. 2 and one of solution No. 3. The last two coats, however, are dried at a temperature of 104 deg. F., instead of 140 deg. F. and horse-hair brushes side by side with the French method. The aprts are given a final rubbing with a polishing cloth.

After the last operation, the parts are immersed in a tank of boiling oil for 20 to 30 min. and left to cool in air for 10 hr. All excess oil is then removed and parts are given an application of light oil.

The American Process

The American process of finishing range-finding apparatus is a comparatively simple matter when placed side by side with the French method. The parts are given two coats of olive green japan, baked at a temperature of 250 deg. F. for 4 hr., and a coat of varnish which is baked at 200 deg. F. for 4 hr. The baked varnish presents a peculiar frosted effect. Parts, on which are scales and dials, are finished so that the scale itself is

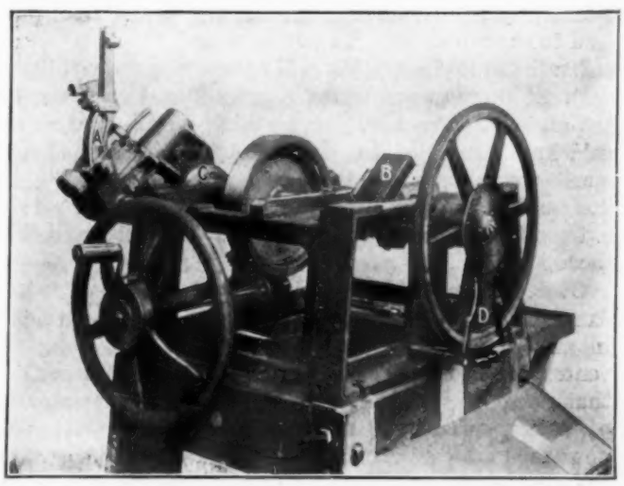


FIG. 36. FIXTURE FOR THE FINAL INSPECTION OF THE RANGE FINDER

ARMY ORDNANCE NEWS

rather dark while the graduations are filled in white. This contrast permits a rapid and correct reading of the instrument.

During the manufacture, the component parts of the apparatus undergo rigid process inspection and in spite of this, parts which are slightly defective find their way into the final assembly. Due to the extreme precision of the instrument, a final inspection is necessary to catch the accumulated errors of the final assembly and to determine if the instrument meets the specification requirements.

The inspection scheme follows the actual field use of the gun. The range finder *A*, shown in partial assembly, Fig. 36, is mounted on a false gun carriage which is designed to perform all the functions of the field-piece mechanism. The straight-edge *B* represents the gun barrel to which can be readily attached a gunner's standard quadrant. A gun-sight adapter is provided at *C* while at *D* is a circular vernier. Targets and points of evidence whose relative range values are known complete the testing equipment. The various elements of the gun sight are focussed on the target and the disposition of the piece for the distance made and a careful check is made of the readings of the range finder with those of vernier.

An agreement of the instrument with the vernier throughout the complete compass denotes a perfect instrument.

On Launching an Invention

By JAMES LESLIE LANE

This article contains a few words of encouragement for the man with a good thing and very little money to push it. Some timely advice as to the best way to get it on the market is included.

MANY a young mechanic with an invention that might be made the basis of a comfortable business fails to make use of his opportunity because of discouraging advice from friends, and a lack of confidence in himself. Usually this diffidence is due less to a lack of confidence in the article itself than in his ability to get it on the market successfully. However sure he may be of its merits, from a mechanical point of view, he is deterred from making the plunge through fear of the obstacles in his path.

Forgetting that whole-hearted enthusiasm is a young man's greatest asset in such a venture, well-meaning friends will seek to throw cold water on the project from the start. As a rule they are men who have neither the courage nor initiative to launch out for themselves and they see only the difficulties ahead of him. When he broaches the subject they will perhaps reluctantly admit that it looks all right, and then proceed to show him why it can't be done.

"In the first place," they will assure him, "the chances are that there is something exactly like it on the market already. Practically everything in the machinery field has been tried out and if such a device had any merit someone would have taken it up before." To their unimaginative minds, the fact that no such article is for sale is proof enough that it has no value, and that there is no call for it.

Overconfidence is a bad thing; yet it has done far less damage than the average man's inability to see promise in and to venture on the untried. If the young inventor is not already discouraged, they will point out that not once in a thousand times does the originator of a new product realize any money from it; that nowadays a lot of capital is required to introduce even the simplest of specialties. In the first place he must have a commercial model built—always an expensive proposition. This will eat up his savings for several months and then, should it still look promising, his real troubles are not yet begun.

Patents must next be taken out, covering the thing fully. And, once obtained, one can't be sure they will amount to much. . . . Patent lawyers are a bad lot. They are always leaving loopholes, and anyway it's money that counts. If it happens to be a success and someone wants to infringe on it he will do so regardless of patents. A poor inventor, having spent what little money he possesses on it, cannot hope to fight the case successfully.

Then, lest some spark of his enthusiasm still linger, he is reminded that an inventor is seldom a good business man; that bankers are chary of lending money except where the venture is already established and its potential earning power proved.

By the time all these possible calamities have been enumerated, the mechanic generally feels that he has been living in a fool's paradise. If he is the kind that is easily discouraged he abandons the idea for good and goes back to his bench, satisfied that it is where he belongs.

However true many of these contentions may be there is no need of his being discouraged. That they are not fatal obstacles is easily seen if he will but look about him. In any city of medium size there are dozens, perhaps hundreds, of small businesses that in the beginning started in the same way he had planned. Obstacles are either great or small, depending on the mental caliber of the man meeting them. Things that may seem mountains to one are but ant hills to another who has sufficient energy and determination.

Having first convinced himself that the article has real merit and that the demand for it already exists or can be created, the inventor would do well to turn his back on the pessimistic ones and trust to himself.

In the first place the question of a commercial model should not deter him. Like a car it may be as cheap or expensive as his pocket will allow, and it need not be completed all at once. If the idea is a good one, it will not spoil overnight but can be made piece-meal

as his wages permit. Remembering that the thing is not yet ready for manufacture in quantities, he need not go to an engineer and have a complete set of working drawings made. They would only have to be redrawn later, as new ideas came, and would be a useless expenditure at this stage. All that is necessary at first are rough pencil sketches of the parts required, and these can be filed away as the work progresses, together with notes for the guidance of the draftsman later on.

If he has a bench at home, and a few tools, he can save a considerable amount by doing some of this work himself. Parts that require lathe work can be bought outside, as well as the standard screws and gears. The patterns he can make himself, getting the castings direct from a foundry and saving the profit a machine shop would ask for doing this for him. Where only one piece of a kind is wanted, he can do the necessary facing with a file, afterward marking off, drilling and tapping the various holes with a breast drill and tap. It may not be quite as easy but the saving will be considerable.

For the sake of a finished appearance, he should go over all metal surfaces with a wire brush, afterward applying a coat or two of black enamel. Piece after piece can be worked up in this way during his spare hours, and finally when all are completed he can assemble them himself. This not only saves money but gives him many little ideas in construction that he would not get if he ordered it direct from a model maker.

Tests are next in order and, should they come up to his expectations, he is now ready to take up the question of patents. If his capital is low it would be well to put the machine aside for a time until he can accumulate some, rather than to see how cheaply he can secure these. A patent is good or worthless, depending almost entirely on how much thought is expended upon it. It is far better in the end to wait until he can afford a good attorney, who has had plenty of experience and who will get for him not merely a patent but protection. If he has never had any work of this sort done, it would be well to go to someone who has and ask them to recommend a good man. Nine times out of ten they will not only do this gladly but will give him many little pointers on what it will be apt to cost, how to proceed, and what to expect in a patent.

Possibly it may be more than he had planned and he may be tempted to seek financial aid at this point, but it should not be done if he can avoid it. As yet he has nothing that is definitely his, nothing that he can bargain with, and it is better to wait. The man whose aid he happened to enlist now would not only have to gamble on the commercial value of the idea but on the possibility of not being able to obtain patents at all, and he would expect too much.

Once the patents have been obtained he need no longer worry lest some unscrupulous person seek to appropriate the idea when he tries to interest him. It belongs to him, and is a tangible asset like capital or a piece of property. No one can use it unless he chooses to give it away. It is the thing he will put into the company alongside the financiers money—just as material a thing, and just as capable of earning dividends. Most inventors who lose out do so through seeking to interest others in an idea before it is really their own, when it is still in a formative stage and anyone's property who wishes to claim it.

With these two stages of the work successfully behind him, he is now ready to seek capital for its exploitation. Nor is this as difficult a matter as is commonly supposed. Two courses are open to him; either to consult a banker and induce him to put up the money outright, or to seek a partner. The latter is preferable for several reasons.

To begin with every business may be divided into several branches; buying, manufacturing, advertising and selling. Each of these functions is equally important and the man who can perform all of them is a rarity. A mechanic is generally fitted for buying and manufacturing, but knows little or nothing about advertising or selling the product when finished. Here a partner with such a training comes in handy. Each supplies the quality lacking in the other and together they make a well-rounded and balanced combination. This is one reason why partnerships are, as a rule, so successful.

Even were he capable of handling all these different branches he would not find the time. A part of the work would have to be delegated to someone and it is better to let a partner, who has as much at stake as one's self, assume charge of it.

Contrary to general belief there are plenty of such men. In every city there are thousands of young chaps, industrious and equipped with a good business education, who are just as eager to get in touch with an inventor as he is with them. Constant contact with affairs has shown them how, if the right opportunity offered, the few hundred dollars they have saved might be made the basis of a good business. They possess the training, the ability to advertise and to sell; but without the proper opening, they are as incapable of making use of it as is the inventor with his own product.

The necessary thing is to get into touch with such an individual, and almost any man of middle age who is in business for himself has under him one or more such men whom he would gladly recommend. If the inventor has the right thing, and a little initiative, the matter of finding capital is not difficult. Money is looking for opportunity just as earnestly as he is.

Having secured its aid the inventor is now ready, or rather he and his partner are ready, to begin actual operations. If they happen to be located in a large city so much the better. It enables them to try out the field without any great initial outlay for advertising.

Starting Operations

The preliminary step is to take the original sketches of the product to an engineer and have a complete set of working drawings made, working in such new ideas and changes as may have suggested themselves at the time of building the first model. When these are ready, a half dozen sets of blueprints should be run off and sent to various shops with a request that they quote a price at which they would contract to furnish the article in lots of one hundred or more at a time.

In the course of a week or two these bids should be received. Assuming that the shops quoted on the expectation of making a 20 per cent. profit and taking the average of all the bids, it is fair to assume that with a factory of their own they could produce it at 80 per cent. of this tentative price. Now by adding on the estimated cost of selling (advertising and sales commissions) and the profit they have fixed for them-

selves, they should know with fair accuracy what the article can be offered to the public for, after it has been placed on a going basis a year or so hence.

An order for 100 or more should now be placed with the firm making the lowest bid, and a short descriptive pamphlet with a cut of the machine, a list of its salient advantages, prices for different sizes, etc., should be ordered from the printer. The thing is now out of the inventor's hands for the present.

If the partner possesses a knack of selling he should be the one to go out and try to interest the public. If not, the aid of a salesman should be enlisted. There is no need of engaging one outright at the outset, there being plenty of time for that later, when the business warrants. Someone who handles a product of a similar nature and who could carry it as a side line is sufficient at first. What is wanted is merely to test out the field—to see what the demand for it is likely to be.

This is apt to prove the most trying stage of all—a period of suspense. It may be months before orders come in fast enough to warrant any further financial outlay, and during this time the partner who has chosen the business end should cover the field with his salesman as often as possible. Selling may not be to his taste but he will meet the trade and pick up many little hints that will help him later on.

A few months at most, in normal times, should tell the story. Either the product is a failure or it meets with increasing sales and shows promise.

If the latter proves the case it is now time to take up the question of its manufacture. This should be gone into gradually, for spending too much money on a shop and machinery is apt to reduce the working capital to a dangerous degree. Sales do not always hold up, collection difficulties may be encountered, and if a surplus is not on hand to meet unforeseen emergencies the new venture is liable to go on the rocks before it is well started.

The best plan is to rent a floor in some building that is equipped with power, benches, etc., and to begin by buying the various parts outside and assembling them here. This gives time to build up an organization and to establish a headquarters. Once this has been done the rest is a matter of natural growth.

Through it all the one vital factor, never to be lost sight of, is that enthusiasm and willingness to attempt things will carry one past obstacles and pitfalls that a pessimistic individual would never even attempt.

A Match Plate for Small Pulleys

BY ELMER W. LEACH

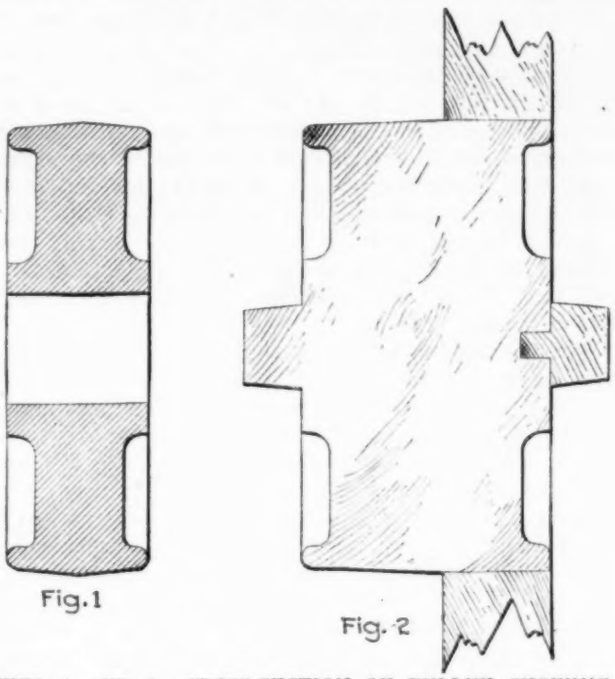
The nature of our product necessitates the making and keeping in stock of several sizes of tight and loose pulleys, ranging in diameter from 2 to 11 in. Recently, when we decided that we had at last standardized our pulleys we felt it was time to have all the patterns made up in some permanent form.

Our first thought was to have aluminum match plates made. With this in view we consulted with a firm that could do this work, but its estimate was so prohibitive that we at once gave up the idea.

Our patternmaker then came forward with a wooden match plate idea. Its good points were so evident that we turned the job over to him for execution.

Fig. 1 illustrates a cross-section of one of our finished pulleys. In Fig. 2 is pictured a cross-section of part of a pattern board, showing in detail how the pattern for this pulley is made and mounted.

The pulley pattern is turned out in one piece, making customary allowances for machined surfaces. To the width of the pulley face is added a width equal to the thickness of the pattern board (in our work this is always 1 in.). On this 1-in. part no taper is turned. The wood around each hub is then cut away to the proper outline, just as though the face of the pattern



FIGS. 1 AND 2. CROSS-SECTION OF PULLEY SHOWING PATTERN AND MATCH-BOARD

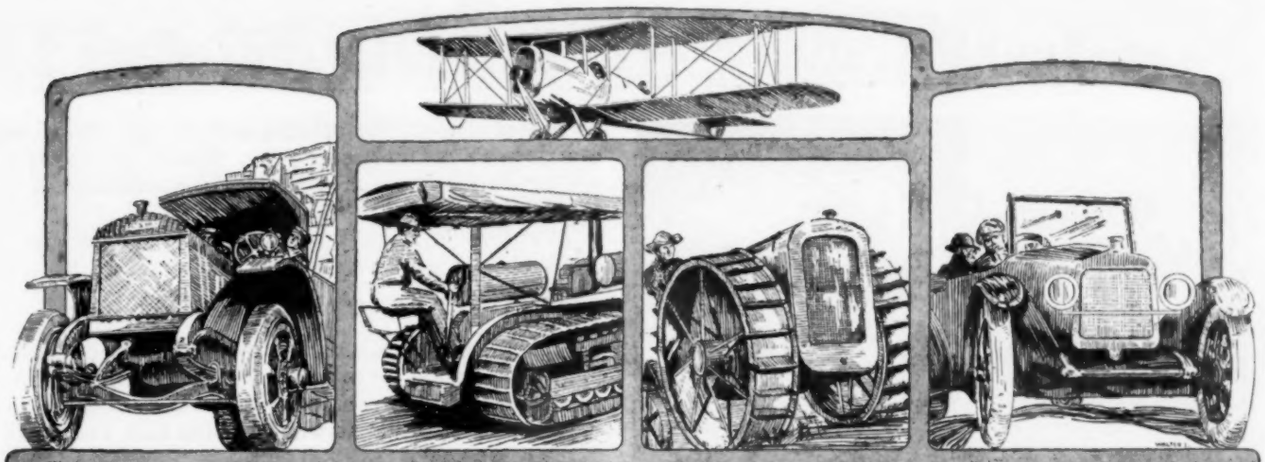
were not 1 in. wider than the actual casting is intended to be.

We have been able to mount from two to ten such patterns on each board. In the board, and through its entire thickness, are bored holes of the same diameter as the outside diameter of the pattern. The patterns are then sunk and fastened into these holes so that the extra 1 in. of the pattern just fills the hole in the board.

When the pattern is mounted in this way, the mold is made practically in the drag. This means less time for making the mold, fewer chances of spoiling the mold (for there is really but one draw) and better assurance that the casting will be free from flaws. Where the mold is wholly in the drag the iron flows naturally and freely down, and one need not fear that it has not gone into all parts of the mold.

By the method I have described, one is assured of a perfect match. The usual way to handle the mounting problem is to make the pattern in two symmetrical halves and mount them on opposite sides of the board. Even if the patternmaker can do this very accurately, his work may be spoiled when it gets into the foundry, for I have seen patterns that had not received any too gentle treatment on the molding floor. But with the method I have explained, there is no chance of producing castings with that small rib around them where the two halves of the mold joined.

Of course, the face of a pulley is usually machined, so the point about the perfect match is not so important in that case. But this method is applicable to any pieces that are circular in outline.



Building a Small Track-Laying Tractor

By FRED H. COLVIN
Editor *American Machinist*

The coming of the tractor has brought new machine-shop problems. Solutions naturally depend upon the shop equipment and the quantity to be manufactured. This article shows some of the methods used in building the "Cletrac" tractor, these being particularly interesting on account of the attention which has been given to convenience in handling the various parts.

THE growing demand for small tractors, for industrial plants as well as for agricultural purposes, has reached the point where manufacturing methods are a necessity if the desired output is to be secured.

These illustrations and practices are from the shop of the Cleveland Tractor Co., East Cleveland, Ohio, and it is interesting to note that the personnel includes a number from the automobile industry. The illustrations include drilling, milling and grinding operations, together with special fixtures which should be of service in affording useful suggestions to others in a similar line.

Fig. 1 shows the fixture for drilling the bearing holes in the pads or treads, which go to make up the moving track on each side of the machine. The body of the fixture is a spool, the central portion being cut away to enable the ears on the treads to assume their proper position under the bushings which guide the drills. The clamps are quick acting, swinging from the lower bolt and hooking over the stud at the top. The screw in the center forces the pad into its proper position and at the same time effectually locks the arm against swinging.

Drilling Transmission Housing

A more complicated drilling fixture is shown in Fig. 2, this being for the transmission housing, which will be seen in more detail in a later illustration. For convenience in handling, the base of the multiple-spindle drilling machine has been built up by the two deep beams of I-section. The guide or bushing plate has been

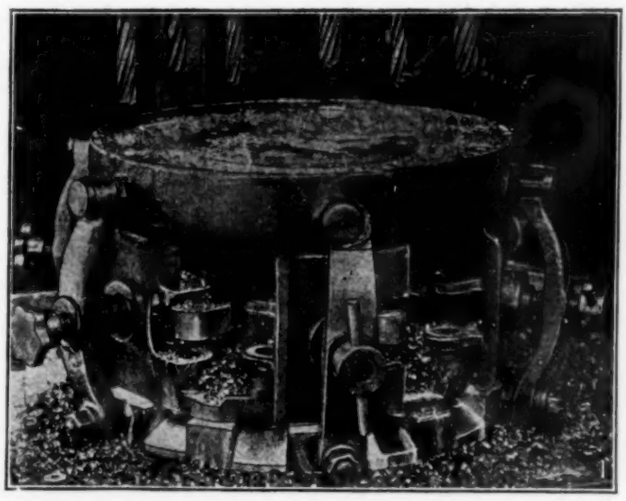


FIG. 1. DRILLING JOINT HOLES IN TRACK PAD

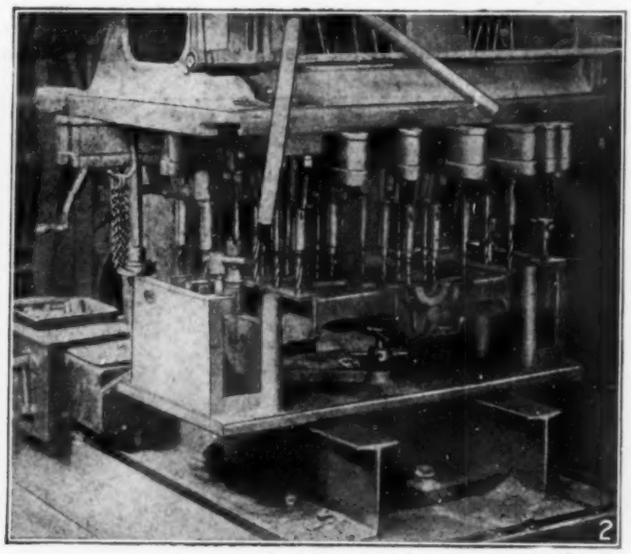


FIG. 2. DRILLING TRANSMISSION HOUSING

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FIG. 3. DOUBLE MILLING SHAFT ENDS

removed in order to show the drills at work; this plate is located by the cone-pointed studs and held in position by the clamping screw shown.

A somewhat unusual milling fixture is shown in Fig. 3, this being for milling both ends of a transmission shaft at the same time. Two milling cutters are used, properly spaced for the work in hand, and the shafts are held in pairs as shown. The clamping block at the top is pulled down by the bolts shown beneath, which effectually wedge them into the V-slot in the body of the fixture. This gives a practically continuous milling operation, as the shafts can be removed as fast as milled, and their places filled by new work. When the table has reached the end of its travel it is reversed and the process repeated.

The Transmission Case Surfaced on Grinding Machine

The transmission case which is shown in Fig. 2 is surfaced on the large face grinding machine shown in Fig. 4. The piece is held in the special angle plate shown, which makes it an easy matter for the large ring grinding wheel to give the necessary finish to the facing surfaces with a minimum of handling.

Some idea of the kind of driving sprocket used in machines of this kind can be had from Fig. 5, which shows the sprocket mounted in the chuck of a large Gisholt lathe. The internal drive gear has already been fastened in position inside the sprocket, which must now be turned true on the outside, and the hole bored concentric with the steel ring gear. This requires careful setting to insure accuracy in the concentricity of the gear and the sprocket.

Then the sprocket is inspected and moved down a conveyor to the assembling department.

Turntable for Assembling

One of the convenient assembling fixtures is shown in Fig. 6. This fixture is a turntable on which the transmission housing is mounted, while the various bearing caps are assembled. It will be noted that the housing

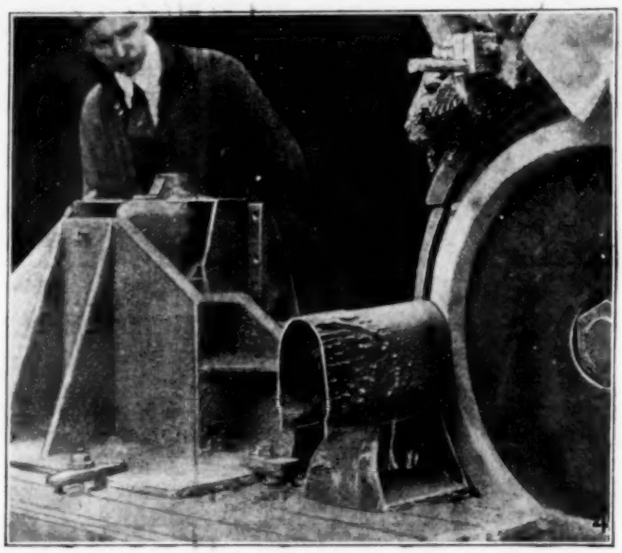

FIG. 4. SURFACE GRINDING A HOUSING

itself rests on a sort of elevated runway with angular sides. These are a convenience in handling and also allow the housing to be set at the angle shown, in order to make it more convenient for the man to put the bearing caps in place. This, of course, depends considerably on the height of the man. After the caps are all in place (and it will be noted that a substantial shim has been placed between each of the four upper caps and the housing itself), the table is turned so that the inside rails match the rails at the right, and the housing is

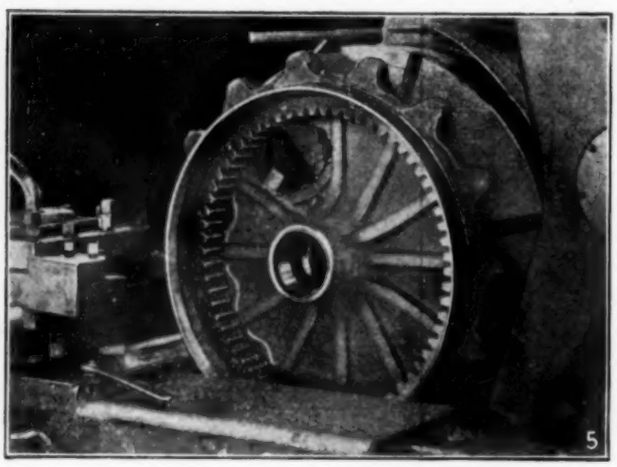

FIG. 5. MACHINING DRIVING SPROCKET

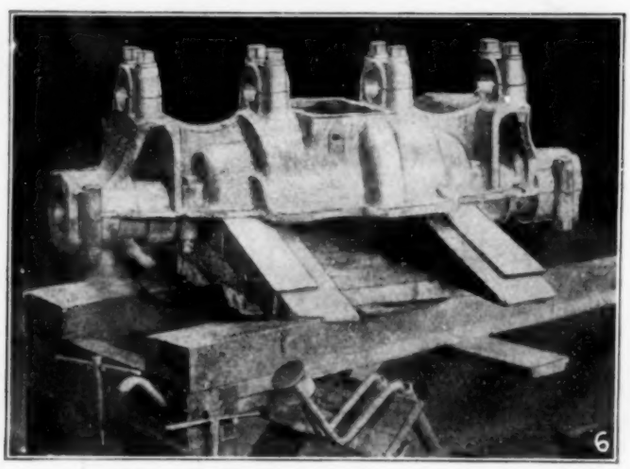

FIG. 6. TURNTABLE ASSEMBLY STAND

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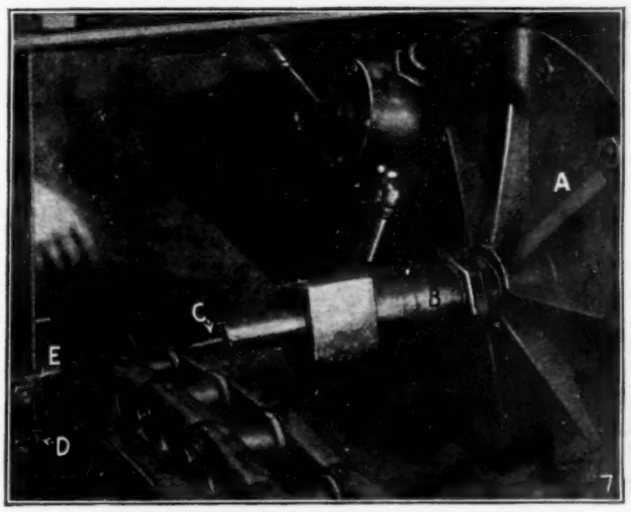


FIG. 7. FORCING PINS IN TRACK BEARINGS

speedily slid from the turntable and down the long rail shown. Both the rails and the turntable are protected with angle iron as shown.

The assembling of the 39 treads which go to make up the complete track is done in an interesting homemade machine shown in Fig. 7. These pins bear in the outside gears while the pads work on the central portion. The assembling is done by a compressed-air cylinder shown at *A*, which, when air is admitted behind the piston, forces out the ram *B* and forces the pin *C* into position in the pad. It will be noted that the pin *C* carries a cross-pin or key by which it is pushed in and which also prevents it being pushed too far. Both ends of the bearing pin are drilled for keys, this being shown in the pins which have already been pushed into place.

Air Is Admitted and Exhausted by a Valve

The treads are moved along the support *D*, while the stop *E* acts as an anvil against the pressure of the air-operated ram. Air is admitted and exhausted by a suitable valve under instant control of the operator. This enables the whole track to be very readily assembled, ready to be placed in position on the tractor and have the final or connecting-pin put into place.

Another subassembly is shown in Fig. 8. These are side frames which carry the idler sprocket as well as the supporting pulleys. The assembling stands are so located with regard to the assembling aisle of the complete tractor that it is an easy matter to slide the completed sides down the inclined rail shown, which places them practically in their proper position for assembly on the completed machine.

Progressive Assembly

In the meantime the transmission is being assembled down the line as shown in Fig. 9. This shows the housing which was being drilled and partly assembled in the previous view, nearly ready for the completed machine. An interesting feature of this transmission is the fact that the steering is done by means of planetary gearing. The two brake bands shown enable the driver to run on either track, fast or slow, and in this way turn the tractor practically in any radius desired. It is a very compact transmission and is shown in place on the chassis in Fig. 10. As will be seen, it is bolted to the end of the side frame, the drawbar with the two clevises being attached to the side frame so as not to impose any strain on the transmission elements. The wheel shown enables the operator to tighten either of the brake bands used for steering; the more he moves the wheel in one direction the shorter the tractor will turn, as in any type of motor-driven vehicle.

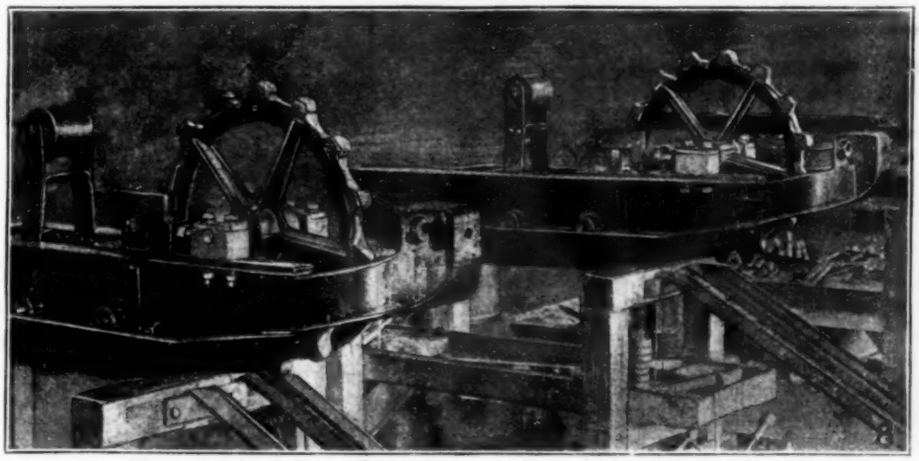


FIG. 8. ASSEMBLING TRACK FRAMES

The assembling line is shown in Fig. 11, the different

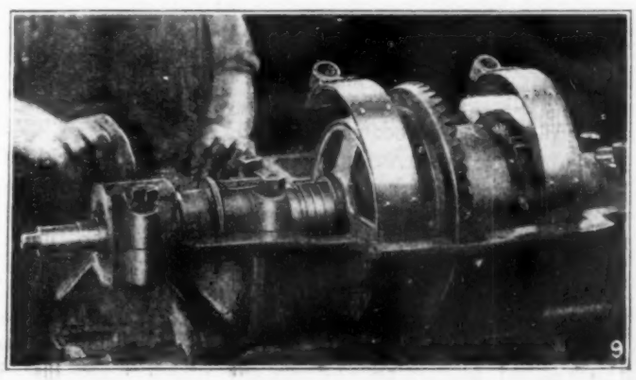


FIG. 9. THE REAR-AXLE TRANSMISSION

AUTOMOTIVE CONSTRUCTION

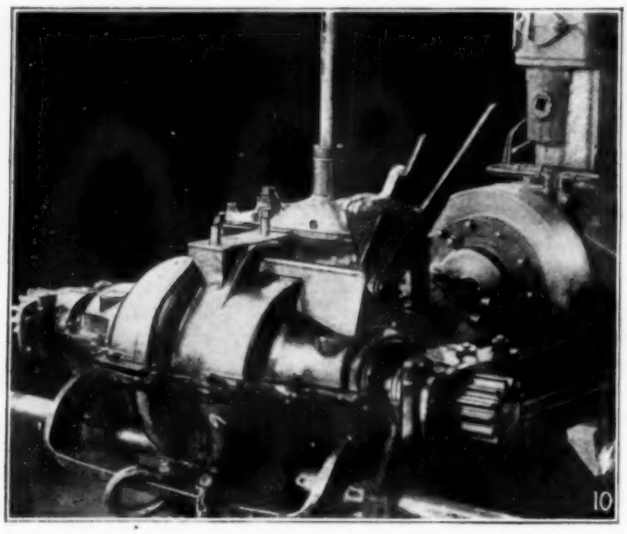


FIG. 10. CHASSIS ASSEMBLY

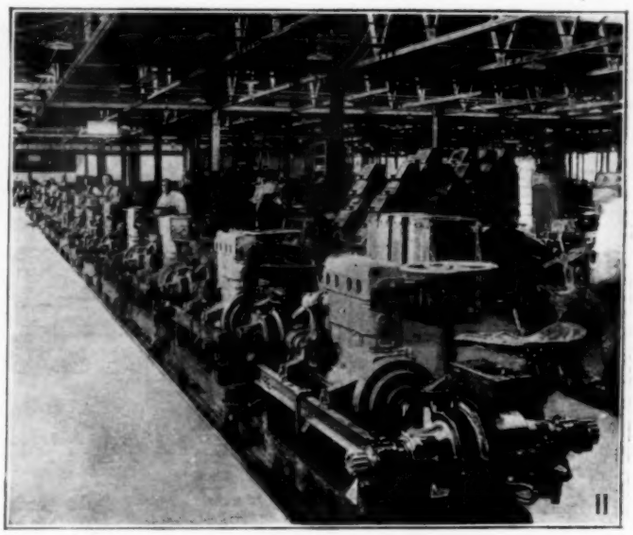


FIG. 11. THE FINAL ASSEMBLY FLOOR

subassemblies coming in from the side at the proper place. When the assemblies shown reach the farther end of the assembling track, the sprockets and the pads of the tracks are put in place. When this is done and the assembling completed, the tractor is driven up an incline each side of the assembling track, raising it completely off the assembling truck shown, and leaving the truck free to be carried back to the other end of the track. The tractor then goes off under its own power, for test or shipment, as the case may be.

Saving in Direct Routing of Work

By H. H. EDGE

General Works Manager, the Locomobile Co. of America, Bridgeport, Conn.

THE importance of direct routing becomes more evident as production increases in quantity, as it not only saves the actual cost of transportation but has its effect on the rapidity with which work moves through the shop, the congestion of the aisles or passageways, and the final output per man. Even the cost of the shop floors must be considered, as there have been cases where excessive trucking from one department to another required constant repairs to the floors in the aisles between the departments.

The lost motion due to indirect routing is shown by the broken lines in the accompanying diagrams while the direct lines show what has been accomplished by rearranging machinery in the sequence of operations, by having the inspection in each department as shown by the "x's" between the circles denoting operations. The general inspection room for parts in process has been abandoned.

These diagrams show what has been accomplished in the plant of the Locomobile Co. of America at Bridgeport and are well worth careful study. Fig. 1 shows the changes which have been made in the machining of motor-car engine cylinders. The circles indicate machine operations; the "x's," inspection operations; the broken lines show the former method, and the solid lines the way in which the work now passes through the manufacturing departments. The column at the left shows the old sequence of operations and includes the central inspection department which necessitated considerable movement of the material, although in some cases it was directly between the two operations.

Reducing Forty Movements to Two

Following the old method it will be seen that the cylinders were moved from the sandblasting department to the inspection room and back to the milling-machine department. Then they were moved to inspection, down to the drilling, back to inspection, to the drilling department and back through inspection to be bored. From here they went to inspection once more, then up to the milling department, back to inspection, and the long jump to the assembling department to be water tested. In this way the whole movement of the cylinder castings can be readily seen and the number of ton-miles moved per month or per year reached an astonishing figure.

By the former method there were 40 transfers from department to department, while by the new routing there are only two, the first from the foundry to the machine shop and the second from the machine department to the assembling floor. The machines are now arranged in the sequence of their operations and require no trucking in order to move them from one to the other.

The machining of the crank case also has two transfers by the new method as against 49 before the change was made. This is shown in Fig. 2.

AUTOMOTIVE CONSTRUCTION

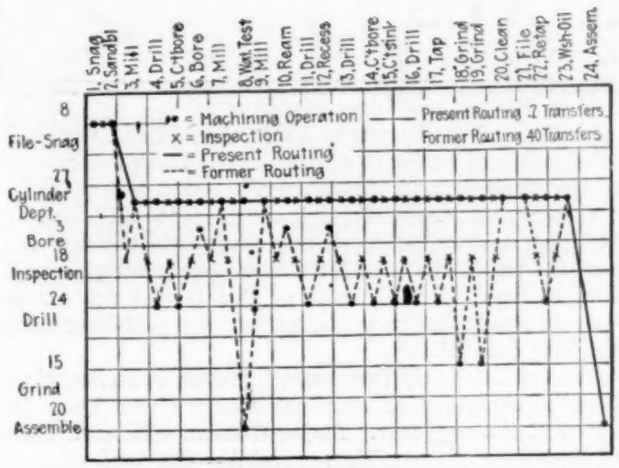


FIG. 1. OPERATION AND ROUTING INSTRUCTIONS FOR CYLINDER

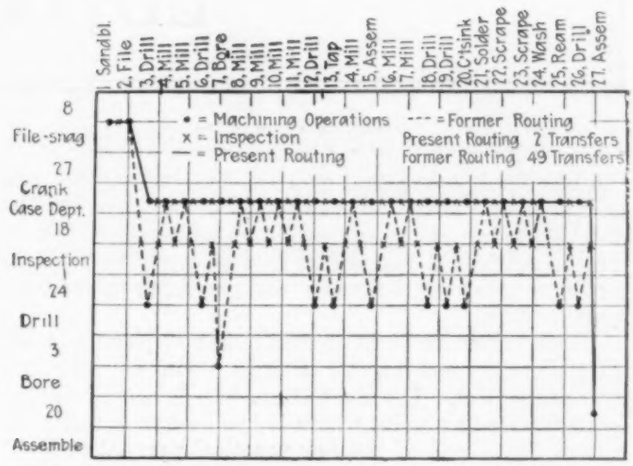


FIG. 2. OPERATION AND ROUTING INSTRUCTIONS FOR CRANK CASE

In handling the crankshaft, Fig. 3 shows four transfers, two of these being necessary on account of the special balancing operation. In order to secure the best results in balancing it is necessary to have the balancing machine in the basement in order to obtain proper rigidity in the foundation, this accounting for the transfer just before the last operation and inspection. As the former method required 56 transfers there remains a clear gain of 52 movements of the crankshaft.

The connecting-rod diagram shown in Fig. 4 indicates that, up to the present, it has not been found practicable to reduce the number of transfers below eight, as against 44 before the change was made. Four of these transfers are required for the forging and heat-treating operations. It will be noted that operation 26 calls for assembling, which means the crank-pin bushing is put in place. This is done in department 20, after which the rod goes back to department 24 for final broaching, operation 27. By placing a broaching machine in the assembling room, the necessity of sending the work back to department 24 would be eliminated.

In addition to saving the cost of handling work in process, this routing of machines for completely machining the most important parts also places the responsibility for production upon one or two department heads instead of dividing it among a great number.

It has been found that the work is much less liable to be delayed where the machining of important parts is segregated, as it is difficult to so schedule work that production will run regularly when various kinds of machines are grouped by kinds, in special departments. One of the main difficulties here is that at certain periods work is liable to accumulate in larger quantities than can be taken care of, and this causes slack periods in other departments where the work does not arrive when it could be worked on to the best advantage.

A careful study of these diagrams can hardly fail to suggest ways in which more direct routing can be applied to various kinds of work in any shop. If in addition to diagrams of this kind a computation can be made as to the number of feet the work is moved, together with the weight of material transferred from one department to another, the advantages of re-arranging machinery to avoid this will become more apparent. This is, perhaps, one of the places where a careful study and comparatively small expenditure may show greater savings in production costs than in almost any other.

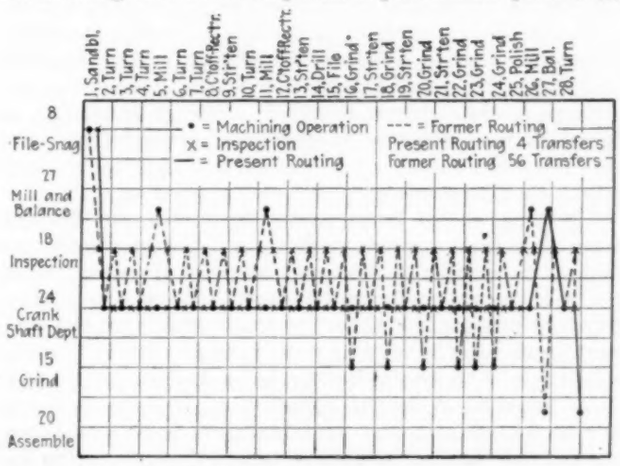


FIG. 3. OPERATION AND ROUTING INSTRUCTIONS FOR CRANKSHAFT

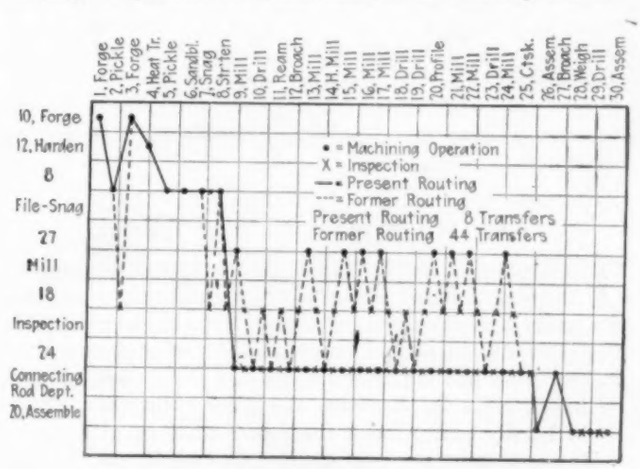


FIG. 4. OPERATION AND ROUTING FOR CONNECTING-ROD

EDITORIALS

Continue the Air Mail Service

ALL WILL agree that real economy in the expenditure of public funds is much to be desired. But the old saying of "penny wise and pound foolish" must not be overlooked and the real development of practical projects must not be made the plaything of political partisanship.

There seems to be little doubt that airplane and airship development depend largely upon governmental encouragement. The Post Office has developed the air mail service to a point where it has become a real institution and is one of the few practical peace-time applications which is rendering a real service to the country. This service has become remarkably reliable and, it is claimed, carries letters almost as cheaply as by rail. While the New York-Washington service does not save very much time, it made excellent training for the longer routes on which time is being saved. The New York-Chicago air mail route, however, saves nearly a day on letters and has become very reliable.

The air mail will do much to encourage the increased use of the airplane along commercial lines. Without it, the development will lag as it did before the war. Every large foreign country, in spite of the huge war debts which confront it, is backing the air service as much as necessary for its development to commercial proportions. Can the United States, the home of the airplane, afford to let its aircraft industry creep along behind all the rest of the world?

No appropriation has been made for a continuance of an air mail service by the Post Office Department, these items having been stricken out of the budget. If this stands, the air mail service ends on June 30, 1920, and the United States becomes the only large country without regular air mail routes.

There were men in Congress who opposed the use of railroads for carrying the mail, demanding that the stage coach and the post rider be continued. The same kind of men are opposing the use of airplanes in mail service. Whether we like the Burleson administration of the mail service or not—and few of us do—we should hold to every advance made and not drop behind the procession. Partisan politics should have no part in determining matters of such grave importance to the industry and to the country. The air mail should be continued and developed.

The Engineer in War Work

THE part played by the engineer in the winning of the war is being resented by certain critics of both the army and the navy of Great Britain, according to *Engineering*. Unusual creations of the engineer such as the tank, the depth mine and the like, were so new, so unorthodox in warfare, that the old-school officers could hardly comprehend their operation or utility.

The necessity for new devices to counteract the lack of shells and of guns forced, for the time being, the relaxation of "the traditional and seemingly inherent opposition of the lawyer and official mind and the work of repelling the menace of the Germans was transferred to the engineer and the factory."

Ours was a somewhat similar experience although the two years which preceded our entry into the war had perhaps paved the way for a more ready acceptance of the engineer. But in spite of this it was not always easy to secure the co-operation which would have made the task less difficult.

We are extremely fortunate, however, in having those high in command of ordnance matters who know the value of the engineer. Major General Williams, Chief of Ordnance, thoroughly appreciates the need of engineers in the development and production of all that goes to make up offensive or defensive armament and is heartily in favor of maintaining contact with the engineering profession through the American Ordnance Association or other channels.

The Navy too appreciates the engineer more than ever and knows how to secure co-operation in most cases. It seems as though we had profited by the mistakes of others in this respect, although it may only be that we have happened to put the right kind of broad-gaged men into the places of authority.

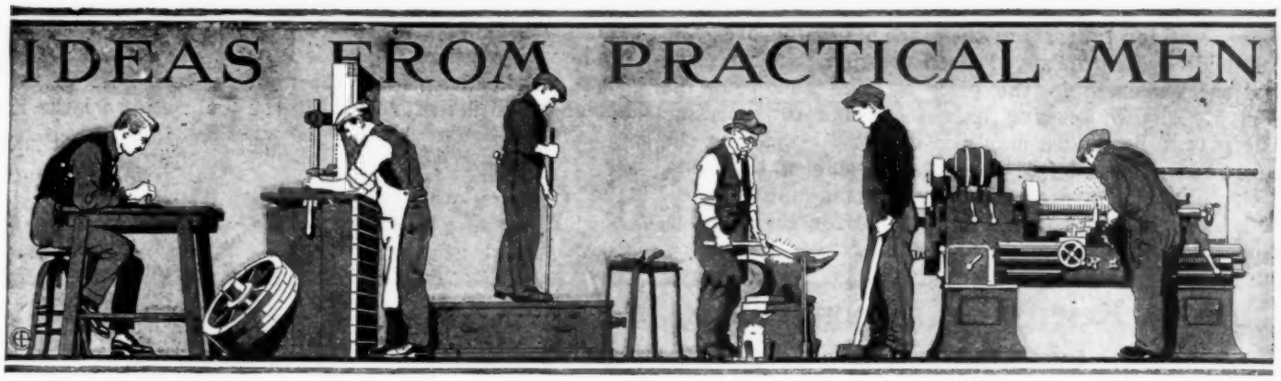
The Question of Fuel

FUEL is the backbone of practically all manufacturing industries and it follows that anything which affects either the price or the prompt supply of fuel is of vital interest to every executive who is responsible for production. This, according to the coal operators, makes the railroad problem of much broader interest than the mere question of shipping their own products. For it is their contention that even if they stored the coal at the mines the railroads lack the capacity to haul it during the seasons when it is most needed.

The problem seems to resolve itself into either greatly increasing the capacity of the coal-carrying railroads, or of storing coal at the industrial centers, the latter apparently being the more feasible.

Why is it not perfectly practicable for the manufacturers in given districts to co-operate in buying such coal as can be stored safely, and having it delivered for storage in the summer months? Storage space can be found in the outskirts of nearly all large cities. But this is such a matter of public welfare that vacant land might even be condemned for such a purpose.

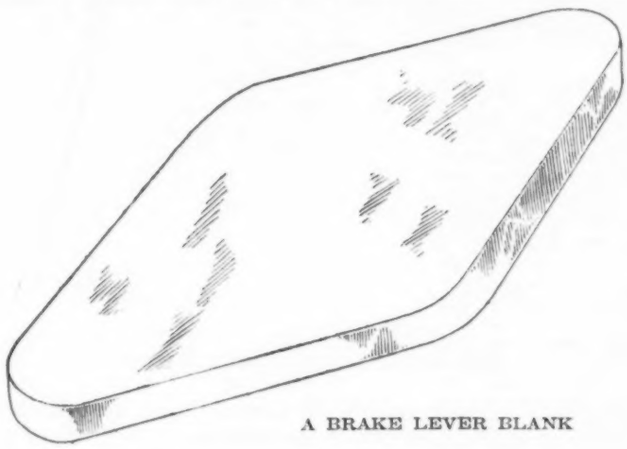
The large motor truck solves the problem of delivery from this local storage yard to any manufacturer and makes it possible to get coal as wanted without congesting the railroads in the least. There are storage yards at present, but these are small affairs for the most part, and handle only domestic coal. Large storage yards might be established by large dealers, but as they have failed to grasp the opportunity, the way lies open for local associations of manufacturers to do a real service not only to their members, but to the community and the coal industry as a whole, which plays such an important part in our welfare.



Punches and Dies of Chilled Iron

BY JOHN S. WATTS

For punching or shearing hot steel, chilled-iron castings will make durable cutting tools at a small fraction of the cost of tool steel. The hardness is not affected by contact with the hot metal and thus the chilled iron does



A BRAKE LEVER BLANK

not become dull from softening, or drawing the temper, as is the case when steel tools are used.

The cast-iron tools are simple and inexpensive, requiring only to be ground on the cutting edge. New ones can be made in a few hours when required, once the pattern and chill is made. Their uses are innumerable and a few general examples are given below.

In the making of brake levers such as that shown in the sketch, the pieces can be blanked out from a hot bar of the proper width in one operation. The cost compares favorably, when a reasonable quantity is to be made, with the regular method, which is to shear off the required length of bar, heat and forge the tapers and trim off both ends to a semi-circular shape in a shearing machine.

For large or thick pieces the blanking will have to be done in a hydraulic press because of the high pressure necessary. It makes no difference what the shape to be blanked is, and, for pieces of a shape awkward to form by forging, the saving will be proportionately greater.

Another point is that the pressure required to shear hot steel being only about one-half of that needed for cold steel, the use of chilled dies makes it possible to blank parts on a shearing machine that would otherwise be beyond its capacity. For instance: if we had to shear a number of bars of heavy section (beyond the capacity of our shearing machine) we could use a pair of chilled-iron knives and cut them hot, instead of by the slow process of hacksawing, to which we would otherwise be obliged to resort.

It is frequently possible to design a die for bull-dozer operations so that the bar is trimmed to length (that is, sheared at the ends) on the same stroke of the machine that bends or forms it.

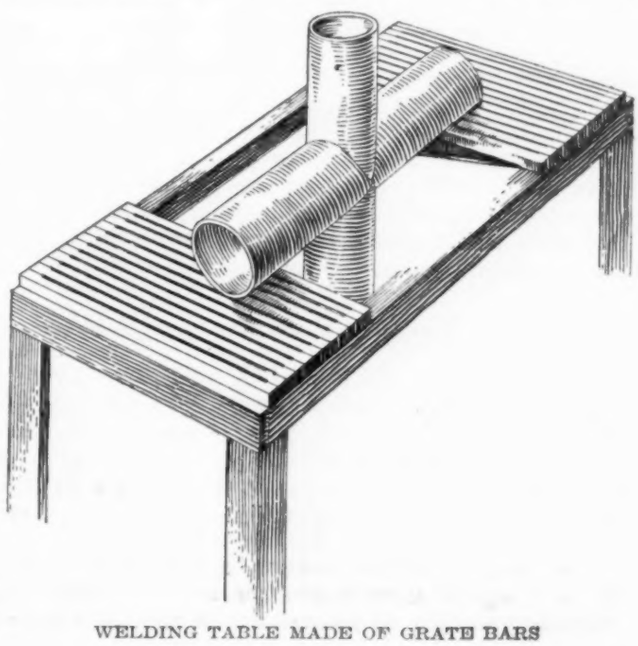
Welding Table Made From Grate Bars

BY CHARLES C. PHELPS

Old grate bars may be used to make a convenient table or bench for electric or gas-welding, brazing, soldering, etc. The support for the grate bars may be made out of a few pieces of angle iron or pipe, and the grate bars are merely placed loosely upon the side bars of the support.

The great advantage of this form of welding table lies in the fact that any of the bars may be easily removed, leaving openings wherever desired for parts to project through, as in the illustration. This often avoids the necessity of building up with bricks to keep a boss, flange, footpiece, hub or other part from resting on the table.

An additional advantage is afforded when it becomes necessary to preheat the work, for it is often possible to place a charcoal fire or oil torch below an opening in the table in order to preheat a part placed on the table. Grate bars placed on either side of curved parts are



WELDING TABLE MADE OF GRATE BARS

convenient for preventing them from turning over and for holding them in any desired position. In the illustration, for example, the piece on the table could be held steadily by placing bars to bridge the opening. The part to be welded may also be tilted by placing the bars in double or triple tiers on one side of the table.

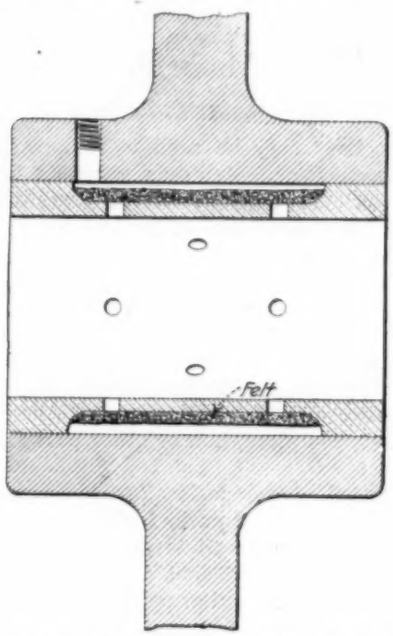
Grate bars are designed to withstand a great deal of heat, which fact makes them ideal for the purpose, especially for oxy-acetylene welding.

An Oil Reservoir in a Loose Pulley

BY JOHN A. SHAND

The loose pulley on a grinding machine had given considerable trouble from lack of oil, and a bushing was made as shown by the subjoined sketch, after which no further trouble was experienced.

The bushing was turned down for a considerable portion of its length both ways from the middle, and the



OILING KINK FOR A LOOSE PULLEY

space thus formed was wound with felt. A number of small holes through the walls of the bushing, under the felt, allowed the oil to get through to the shaft.

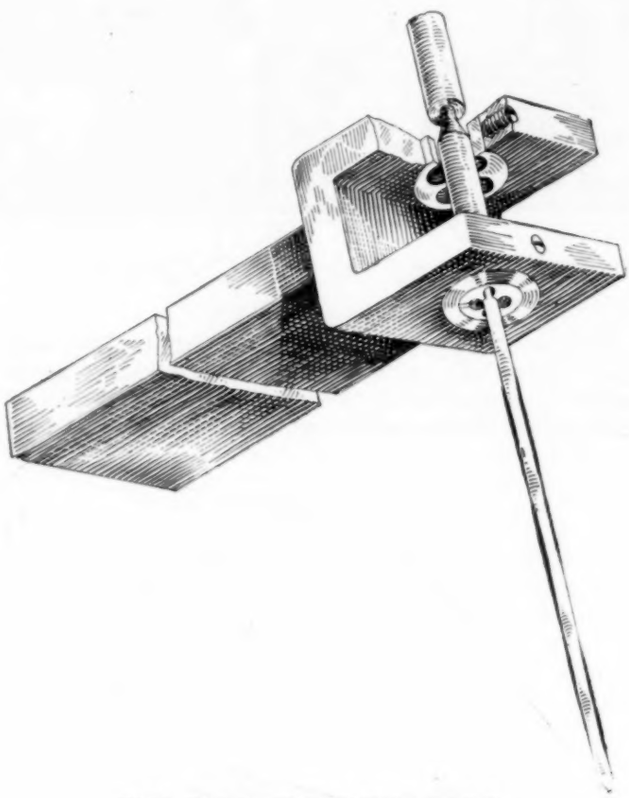
A large hole was made in the hub of the pulley and fitted with a pipe plug. This hole provided for filling the hidden recess between the bushing and the bore of the pulley, and the felt, being saturated with oil, removed the tendency of the pulley to run dry.

Double Turning Tool for Small Work

BY H. M. FAY

A turning tool to be used on a lathe for machining two diameters on long and slender work is shown in the illustration. These parts are made in various lengths on the small diameter which is $\frac{7}{64}$ in., while the $\frac{3}{16}$-in. diameter parts are all of the same length.

The work being so long in comparison to its diameter, is very springy under the cut when turning in the ordinary manner, even though a follow rest is used. To overcome this lack of resistance, two turning dies are employed, which are similar to threading dies except that smooth lands instead of threaded lands are used and the beveled edges of the lands are made to act as cutting edges. Two dies of correct diameter are held in the holder which is in turn held in the toolpost of a lathe in



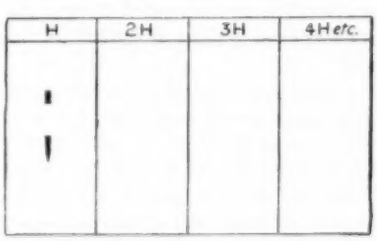
TOOL FOR TURNING SMALL STOCK

the usual manner, care being taken to have the two dies lined up with the spindle of the machine. The carriage of the lathe is then fed forward and the dies turn the work to the shape shown. A little extra length is allowed for gripping these parts in a chuck and this is afterward cut off, leaving the work pointed at the end.

Saving Short Leads for the Compass

BY HARRY H. MORSE

When a pencil gets too short to be used conveniently, split it open, take out the lead and stick it into a piece of drawing paper that has previously been prepared as



A KINK FOR SAVING COMPASS LEADS

shown in the sketch, roll up the paper and put a rubber band around it.

In this way you will be assured of always having compass leads of whatever grade may come within the range of the drawing pencils you use.

What Real He Men Think of the Compulsory Metric System

East Pittsburgh, Pa., Jan. 27, 1920.
Ethan Viall, Editor,
American Machinist.

Dear Sir:

I have your letter of the 23rd and know of the movement under way to force a law making the use of the metric system compulsory.

I believe this is absolutely wrong and detrimental to the interests of the American people. It would entail tremendous expense and difficulties on manufacturers and, I believe, accomplish no useful purpose. In a great many respects the metric system is not so well adapted to use in industry as the system of weights and measures we now employ.

If you will communicate with F. A. Halsey, Commissioner of the American Institute of Weights and Measures in New York, I am sure he will be able to give you all the facts and figures you may need to fully substantiate what I am saying.

I believe every effort should be made to defeat a movement of this sort.

Yours truly,
WESTINGHOUSE ELECTRIC & MFG. CO.
E. M. Herr,
President.

St. Louis, Mo., January 28, 1920.
American Machinist.

Gentlemen:

The adoption of a law to make the use of the metric system of weights and measures compulsory, would in our opinion be not only unwise but thoroughly impracticable.

For various kinds of work and material many standards of measurement are in more or less general use, and it is reasonable to assume that each standard has some advantage for the purpose or it would not be continued in use.

Even though the metric system should be adopted by law, the use of the old standards would be continued in many localities by common consent, and the law practically would be inoperative.

While decimal systems have some advantages, they also have some definite disadvantages. The increments of 1/10 and 1/100 are too greatly different to meet average requirements, and, on decimal systems in use, values of ½ and ¼ and ⅛ of the unit have been found to be practically necessary.

The adoption of the metric system by law would impose unmeasurable difficulty and expense upon every individual and business. There would be a very long period of continual turmoil, and even though all of the theoretical advantages of the metric system could be realized, which is hardly possible, its disadvantages would very largely offset the advantages.

The net results would in our opinion be an appalling loss, and we wish to place ourselves on record as opposing a law to make the metric system the only legal standard.

Yours very truly,
THE EMERSON ELECTRIC MANUFACTURING CO.,
H. I. Finch,
Vice President and Superintendent.

Mr. Ethan Viall, Editor,
American Machinist.

Dear Sir:

If the bill which provides for the compulsory adoption of the metric system of weights and measures in the United States is enacted, industry in this country will suffer losses of billions of dollars and will be thrown into a state of chaos that would result in practical paralysis.

The propaganda which has been directed by proponents of the metric system while insidious and fallacious, has been widespread and successful in so far as it has induced various chambers of commerce and semi-trade bodies to pass resolutions favoring the adoption of the system, and to forward them to Congress. These organizations do not, however, represent the manufacturer who is the one actively concerned in the issue. In fact, it is doubtful whether manufacturers as a whole fully realize that this danger has reached such a menacing status.

Transition from our present standards to those of the metric system would mean the introduction of a dual standard as has been the case in other countries where the change has been made. Results would be exactly the opposite of those claimed by its advocates—complexity instead of simplicity, confusion instead of order, and diversity instead of uniformity. Not only would there be confusion and loss through the necessity of converting from one standard to the other in commercial transactions, but it would require complete new equipment in many forms of measuring equipment, tools, gages and innumerable articles of manufacture, not to speak of changes in designs, plans, etc.

Advocates of the metric system argue on the advantages of a uniform world system, but this disappears in the face of the fact that its adoption has in no country brought about a uniform system in domestic affairs, while in most countries it has been a grotesque failure. The most favorable result has been nothing mo e than a partial change, the old system continuing in use along with the new, and leading to nothing but hopeless complexity, confusion and disorder.

If the metric system had possessed any merit, it would have been put into use in this country long ago, not by force of law but by that of expedience. The very fact that the people of the United States have declined to avail themselves of its principles and to abandon the system to which they are accustomed, should justify the denial of the passage of a law to enforce its adoption.

Whatever the nature and purpose of this metric propaganda that is so effectively making its impression in this country, it behooves every American citizen to realize the influence such an enactment would have upon American life and industry, and to act accordingly lest we learn its results when it is too late, as has been the case with other forms of insidious propaganda.

Very truly yours,
INTERNATIONAL MOTOR CO.,
R. E. Fulton,
Vice President.

Muskegon, Mich., January 28, 1920.
American Machinist.
Attention Mr. Viall, Editor

Gentlemen:

In regard to the compulsory use of the metric system, in our judgment such action on the part of our Government would be a calamity. In our shop, where we produce nothing but camshafts, all of our men are specialists on some one operation. They are not used to the reading of drawings, and as a rule have had very little training in arithmetic. They have become familiar with our present system, but a change to the metric system would make it necessary for us to have all blueprints explained to them.

We certainly would not take very kindly to being compelled to adopt in our shop a system of which we did not approve. It hardly seems to us possible that such a law could be made compulsory. It certainly should not be.

Yours very truly,
MUSKEGON MOTOR SPECIALTIES CO.
F. C. Whitney,
Secretary-Treasurer.

Trenton, N. J., January 28, 1920.
Ethan Viall, Editor,
American Machinist.

Dear Sir:

We are by no means in favor of any law which would make the use of the metric system compulsory. It would mean the sacrifice and destruction of many thousands of dollars in tools, jigs, etc., which are now in use, besides creating a period of confusion which would be very disastrous.

We see no reason whatever why a system based on decimal parts of the inch would not be in every way satisfactory.

Very truly yours,
JOHN A. ROEBLING'S SONS CO.
Karl G. Roebling,
President.

Tiffin, Ohio, February 4, 1920.

Ethan Viall, Editor,
American Machinist.

Dear Sir:

Referring to your article in the *American Machinist*, dated January 22nd, on a compulsory metric system, we inclose copy of a letter which we are sending today to the Committee on Coinage, Weights and Measures, also copies of our letters to our Congressman and Senator.

Until the world adopts the metric system, the United States certainly cannot afford to "play it alone." **Nothing could so boost the export business of Germany as to have the metric system forced upon us by our Government.**

Very respectfully,

THE NATIONAL MACHINERY CO.,
E. R. Frost,
Manager.

Tiffin, Ohio, February 4, 1920.

Hon. Atlee Pomerene,
U. S. Senator,
Washington, D. C.

Dear Sir:

The World Trade Club of San Francisco (which we understand is fathered by a millionaire with a hobby) and also a number of theorists, college professors, etc., are making a desperate effort to have the metric system of weights and measures adopted as the legal standard for this country.

We attach herewith an explanation which shows the extent to which the various screw thread standards are used throughout the world. Of course, the screw thread standards are indicative of the form of measurement used on the balance of machinery and other mechanical measurements. For your own information we suggest that you read the attached letter, as we are in position to supply this information authoritatively because we build screw threading and nut-tapping machinery which is sold all over the world.

The claim can be disregarded that the selfish interests of American machinery builders and other manufacturers prevent them from adopting the metric system on account of the cost of the change. Even if the metric system were adopted, it would still be necessary to build machinery to English dimensions if we attempted to hold any of our export business.

After you have read this letter, you may prefer to pass it to some member of the Committee on Coinage, Weights and Measures.

Very respectfully,

THE NATIONAL MACHINERY CO.,
E. R. Frost,
Manager.

Tiffin, Ohio, February 4, 1920.

Hon. Jas. T. Beggs,
13th District Ohio,
House of Representatives,
Washington, D. C.

Dear Sir:

The World Trade Club of San Francisco (which we understand is fathered by a millionaire with a hobby) and also a number of theorists, college professors, etc., are making a desperate effort to have the metric system of weights and measures adopted as the legal standard for this country.

We attach herewith an explanation which shows the extent to which the various screw-thread standards are used throughout the world. Of course, the screw-thread standards are indicative of the form of measurement used on the balance of machinery and other mechanical measurements. For your own information we suggest that you read the attached letter, as we are in position to supply this information authoritatively because we build screw-threading and nut-tapping machinery which is sold all over the world.

We feel that this information will be of value to the House Committee on Coinage, Weights and Measures, and we will much appreciate it if you will kindly see that this is delivered to the Chairman of this Committee.

Thanking you for your attention to this, we beg to remain

Very respectfully,

THE NATIONAL MACHINERY CO.,
E. R. Frost,
Manager.

Tiffin, Ohio, February 4, 1920.

House Committee on Coinage,
Weights and Measures,
Washington, D. C.

Gentlemen:

In regard to the pending legislation concerning the adoption of the metric system of weights and measures in this country, we are taking the liberty of calling to your attention the fact that we are extensive manufacturers of bolt and screw-threading machinery and nut-tapping machines, and as we have specialized on this class of machinery for a great many years, our machines are sold throughout the world.

Many statements are made by advocates of the metric system that this system is largely used in other countries except the United States. This statement is not only misleading, but is incorrect.

You, of course, readily appreciate that we have exact knowledge in regard to the threads that customers cut upon their bolts and nuts, as we supply the threading dies and taps with our machines, and the customer, of course, advises us just what form of thread is wished. Furthermore, we do a large business in supplying extra dies and taps to these same customers, which constantly shows us the kind of threads they are cutting.

It is patent that a foreign customer who would be using metric measurements in his work would almost from necessity be compelled to use the same metric measurements on screw threads. Many foreign customers send us blueprints showing the work they wish to thread, and it is universally the case that the same standard of measurements used in expressing the dimensions of the threads are applied also to the other general dimensions of the work. Consequently, authentic data in regard to the form of the standard of threads used by various foreign customers on their bolts, nuts and screws is almost conclusive evidence in regard to the extent of the standard of measurement which they use.

The data on standard threads used in the various countries as shown by the orders which we receive are as follows:

In England, Whitworth standard threads (which as you know are measured in inches) are used exclusively. It is rare indeed to either receive a call for metric thread dies or taps from England.

In Norway, Whitworth standard threads are used almost exclusively.

In Denmark, Whitworth standard threads are used almost exclusively.

In Sweden, Whitworth standard threads are used almost exclusively.

In Russia, Whitworth standard threads are used almost exclusively.

In Germany, Whitworth standard threads are used almost exclusively.

In Austria, Whitworth standard threads are used almost exclusively.

In Australia, Whitworth standard threads are used almost exclusively.

In Japan, Whitworth threads are used almost exclusively, although U. S. S. threads are used to some extent.

In South and Central America, U. S. S. threads predominate, although Whitworth threads are also used.

In Mexico, U. S. S. threads are used almost exclusively.

In Canada, U. S. S. threads are used almost exclusively.

In the United States, U. S. S. threads are used almost exclusively, although the S. A. E. pitch of U. S. form of thread is largely used by the automobile people. The use of metric threads in the United States or Canada is exceedingly rare.

In France and Belgium the metric or International form of thread is generally used. However, the Whitworth thread is used also, especially where work is to be exported by manufacturers in France.

In Italy, both the metric and the Whitworth threads are used.

In Switzerland and Portugal, the Whitworth threads predominate; metric threads are also used.

It is evident, hence, that the only extensive use of metric standard threads is in France and Belgium.

Whenever manufacturers in either of these countries are compelled to export their product to other countries they are immediately compelled to supply Whitworth threads. The other exporting nations of the world, such as England, Germany, Austria, Japan and the Scandanavian countries use Whitworth standard threads almost exclusively, except on their export orders to France and Belgium.

Builders of machinery and manufacturers of bolts and nuts in this country are, hence, in infinitely better position to handle export trade by building their machinery to English dimensions, as, of course, both the Whitworth and the U. S. Standard threads are computed in English measurements. When it is necessary to export to France or Belgium, we equip our machines with special attachments and adjustments which enable the metric form of threads to be handled. Consequently, we have every advantage on French export business; and, of course, the average manufacturer of American machinery is able to index the dimensions in the machinery for French consumption, in the metric system. However, to adopt the metric system as a standard in this country, would not only result in untold confusion here, but it would still make it necessary for practically every manufacturer to also build his machinery to English measurements for exportation to practically all countries in

the world, with the exception of France and Belgium.

It seems evident that the demand for the adoption of the metric system in this country must come from people who are not familiar with the situation; or it is an organized effort on the part of Germany to get this country to adopt a form of thread which will cause untold confusion, not only for our own manufacturing plants, but will also practically shut us out from the world markets. At the present time every manufacturer of machinery is in position to supply machines indexed either for U. S. standard, English or metric dimensions; and regardless of what type of legislation is passed in this country, the manufacturer of machinery will still be compelled to furnish U. S. standard and English dimension machines if he has any hope of holding his export trade. Supplying, as we do, threading and tapping machinery to customers in practically every country in the world, we can see the state of chaos which would result if the metric system were forced upon manufacturers in this country. This matter is one of shop practice, and should be handled exclusively as such, and in our opinion suggestions or advice from theorists, college professors or any one not actually engaged in shop work, should be considered noncompetent.

Any further information which our files on this subject set forth is at your command, should you so desire.

Very respectfully,

THE NATIONAL MACHINERY CO.,
E. R. Frost,
Manager.

Worcester, Mass., December 26, 1919.

Hon. Samuel E. Winslow,
House of Representatives,
Washington, D. C.

Greater part of active propaganda now being presented in favor of metric system is based upon misinformation if not actual misrepresentation. Proposed measures are in our opinion utterly chimerical and unnecessary. Their adoption would cost us one hundred thousand dollars per year, and force us out of business. We are now doing active export business to England, France, Spain, Brazil, Argentine, Australia, without least demand or necessity for other than present system. Manufacturers have enough troubles without having to combat any such monstrosity of academic idealism.

BOSTON PRESSED METAL CO.

Barbourville, Ky., February 3, 1920
American Machinist.
Attention Ethan Viall, Editor

Dear Sir:

In relation to the bill making the use of the metric system compulsory, which Congressman Vestal is expected to introduce in a few days, we want to go on record as being unalterably opposed to such legislation.

The metric system was made legal in the United States in 1866, and if it had been of any practical use to manufacturers of the country it would be their standard now.

While our company does not carry the complicated equipment that many others do, it would cost us thousands of dollars to change our system of measurement. It would mean the re-education of all our force from the officials down. It would mean the changing of all our measuring devices, the remaking of all our calculating tables, and be a source of confusion and costly mistakes for years to come. You can readily see what a hardship it would be to us, and how much more to larger companies using immense numbers of special tools, jigs and fixtures.

We will back you to the limit in your fight against this useless disturbance of American industry.

Sincerely yours,
T. W. MINTON & CO.,
N. E. Minton.

Cleveland, Ohio, February 4, 1920.
American Machinist,
Ethan Viall, Editor.

Dear Sir:

With respect to the question of adopting the metric system in the United States, this would cause an absolutely useless economic waste of millions of dollars in discarded tools, machinery and designs, in mistakes due to the change of system and delays caused thereby, and all to no sensible purpose.

There is a far greater proportion of the world using the present English standards adopted in the United States than those who use the metric system, and the change would, therefore, be adopting something in less general use than the system already in use. What this country needs is greater production per man, and any such change would, for a long time, have a most decided effect in reducing individual production and decreasing efficiency.

Yours very truly,

THE BROWN HOISTING MACHINERY COMPANY,
Alexander C. Brown,
President.

Pittsburgh, Pa., Jan. 30, 1920.
Ethan Viall, Editor
American Machinist.

Dear Sir:

I would *not* like to see the metric system made compulsory. As I understand it, the metric system is now legalized for use but not as an exclusive system. It would be a high crime to do away with our present standard and make compulsory the use of the metric only. It would mean chaos, inefficiency and a great decrease in production. Men in shops, salesmen and buyers in all lines of industry and commerce would have to think in a foreign language. It would mean a disturbance and retarding of trade, but above all, it would tend to destroy production to such an extent that it would cause a blight over the whole country. In times like these when we are trying to get back to our old standard of production, which we have not by any means reached, it would be the most disastrous blow that could be laid on American industry. Picture the hundreds of thousands of mechanics and machine-shop hands in our factories alone, engaged in study rather than in production!

I do not think the time should ever come in this country of ours when we should consider the metric system to be the only exclusive system of weights and measures. Now that we are to have a great merchant marine, can not the two English-speaking countries stand by their own system of weights and measures and force its adoption in other countries? It would take years for industry to recover from such a blow as to enforce immediate use of the metric system.

Yours very truly,

GARLAND MANUFACTURING CO.
Robt. Garland,
President.

Pittsburgh, Pa., January 29, 1920.
Ethan Viall, Editor,
American Machinist.

Dear Sir:

As you have asked for a sharp and brief statement of our views in relation to the movement to force through a law at the next session of Congress making the use of the metric system compulsory, I can perhaps make it sharp enough by saying that to me it seems nothing short of criminal. I cannot believe that the people back of this movement are actuated by any other than selfish reasons. Just how they expect to profit I do not know; perhaps they do. The danger is none the less because the metric advocates have many specious arguments which appeal to the unthinking. *The company which I represent has a world wide trade* and even in countries using the metric system our product is now thoroughly understood and established under English measurements and it would perhaps be almost as disastrous to them to readapt themselves to the change as it would be for us to readjust our entire industrial program.

We are having a great deal of compulsion these days and some of it is necessary, but there is a limit to the burdens which can be borne by a long suffering public.

Yours truly,

OIL WELL SUPPLY CO.
Louis C. Sands.
Vice President and General Manager.

South Milwaukee, Wis., Jan. 26, 1920.
Ethan Viall, Editor,
American Machinist.

Dear Sir:

We are definitely opposed to the compulsory adoption of the metric system, believing that the cost to the United States would be incalculable.

Most discussions on the subject lay stress on inconvenience and cost to manufacturing concerns and the workmen employed by them, but it must not be forgotten that every farmer, every tradesman, every workman, every housewife, and in fact every inhabitant of the country would be affected, inconvenienced and subjected to expense.

We are hopeful that Congress will not waste time on this subject.

We consider it remarkable that advocates of the metric system seem to be unacquainted with our Government hearings and reports on the subject of the metric system published in respectively, 1879, 1906 and 1907. We are confident that if new hearings were held at the present time, the weight of evidence against the compulsory adoption of the metric system would be even greater today than it was fourteen years ago and forty years ago. It is not apparent, however, that new hearings should be held, as it is believed

that a brief study of history as shown by these reports is sufficient to convert any metric advocate who is not biased.

Yours very truly,

BUCYRUS COMPANY
W. F. Russell,
Second Vice President.

Pittsburgh, Pa., January 27, 1920.

American Machinist.

Gentlemen:

In reference to the metric system and the effort that is being made to make it compulsory by an act of Congress to use that system of weights and measures, would say that we are very much opposed to any such action and have been using our efforts against it.

At the meeting of the American Gear Manufacturers' Association in Boston in October, 1919, the writer offered a resolution, which was unanimously adopted, against the adoption of the metric system. A copy of the resolution was forwarded to the American Institute of Weights and Measures and your correspondent probably took a record of it at the meeting. Copies were also sent to President Wilson and Hon. Lloyd George.

The decrease in production which would be caused by any change in our system would be enormous and the cost would run into vast sums. We trust that you will use the efforts of the *American Machinist* against any change by Congress.

Yours very truly,

THE SIMONDS MFG. CO.,
Biddle Arthurs,
President.

Brookville, Pa., January 27, 1920.

Honorable Nathan L. Strong,
Congressman,
Washington, D. C.

Dear Mr. Strong:

It seems that this Government is on the verge of breeding a big radical measure when considering seriously the thought of changing the present standard of measure to the metric system. I would, therefore, ask your support to help defeat such a bill for the following reasons:

It will tend to increase, rather than reduce the high cost of living. It will be a back set rather than an uplift to the present generation to make this change, considering how very few people know or care to know what a cubic centimeter is. The present textbooks, purchased at a great outlay of money by states where free textbooks are issued, and also by individuals who will be required to buy new books for their children at school, would all have to be changed at a greater expense due to the present cost of paper.

The educators of today will not take up this new feature and apply it at once without detriment to the education of the pupils. The waste of labor and material that would be involved in hundreds of thousands of forms is not justified. It would no doubt be the forerunner of business failures in hundreds of ways.

We depend upon the manufacturers to provide us with machinery in all forms, and upon this machinery we are dependent to a great extent for our various needs; the manufacturers of the machinery and the users of the machines are not wanting the change, even though they know that the public will pay the bill.

Grave issues of this kind are liable to cause panics which should be avoided, if possible. A few people of these United States in power or influential with the forces have no right to launch a hobby at the cost of the multitude. The Government at the present time is deporting some radicals.

Considering a concrete example, would it be convenient or consistent to tear down the brick house in which you live, for the sole reason that you desire a different size brick used in the construction—the house when completed to be the same size throughout, the same color of brick and no change, except that you have another standard size of brick. Remember at the same time you are tearing down and rebuilding, you must live in the house.

The principle of changing from the present standard, as I see it, is just the same—with the exception that it will require a period of years to make the change, the cost of which would overbalance any gain and the net result would be unnecessary expense and inconvenience to the point of hardship, ruin and the upbuilding of radicalism, a feature which at all times should be guarded against.

Yours respectfully,

P. & S. RAILROAD,
E. L. Frazier, Jr.,
Leading Draftsman and Motive Power Inspector.

Cleveland, Ohio, January 31, 1920.

Ethan Viall, Editor,
American Machinist.

Subject: Metric System.

Dear Sir:

Acknowledging receipt of your letter of January 23, calling attention to a movement now under way to force through the next session of Congress a law making the use of the metric system compulsory.

We are strongly opposed to the passage of any such legislation, and hope that there will be no relaxation in the very effective effort which has been exerted in the past by the *American Machinist* against the compulsory adoption of the metric system.

Yours very truly,

THE GRASSELLI CHEMICAL COMPANY,
J. H. Dunbar,
General Superintendent.

Rochester, N. Y., January 31, 1920.

American Machinist.

Gentlemen:

Regarding the proposed compulsory adoption of the metric system of measurement, we beg to say this is a matter of utmost importance to the manufacturers of this country, and it has received far too little attention on their part.

We cannot understand why our Government should even consider a change without first consulting those who are most vitally interested and upon whom the burden will fall if put into effect.

We have been doing an export business for over twenty-five years, and we have never yet found necessity for changing our present system of measurement in even the slightest degree. The enormous expense and confusion which the change would entail is entirely beyond conception, and why all the manufacturers of this country should be compelled to assume this load simply to gratify the fancy of a few individuals, who, remarkable as it seems, have succeeded in making many people believe that the adoption of the metric system will work some great miracle in our export trade, is beyond comprehension, because we do not know of even a single advantage or benefit it will bring.

Yours very truly,

RITTER DENTAL MANUFACTURING CO., Inc.,
O. H. Pieper.

Brooklyn, N. Y., January 27, 1920.

Hon. John McCrate,
House of Representatives,
Washington, D. C.

My dear Sir:

It has just come to my notice that there is an organized movement, or perhaps a clearer statement is, that a millionaire with a "hobby" is trying to foist on this country a compulsory metric system of weights and measures.

You undoubtedly realize that in hundreds of industries and particularly the machine and tool industry that the cost of a sudden compulsory change from inches to the metric system would cost billions of dollars because of the necessity for scrapping all of our measuring instruments and the most vital parts of our manufacturing machines which are now all graduated to inches.

I understand the metric system and assure you it has its limitations as well as any other system of measurement, particularly in the machine-tool field, because of the wonderful convenience and comprehensive measurement of the inch when divided into 1000 parts as it is most used.

Won't you please use your influence against the unwarranted and pernicious activities of a few people who are trying to force their particular hobbies down the throats of a very patient public and cause untold loss to the business world and throw thousands of people out of work during a compulsory readjustment period which in the writer's estimation would take at least ten years to accomplish.

Most sincerely yours,

EASTERN TUBE AND TOOL CO., Inc.,
Geo. W. Emrick,
Superintendent.

January 14, 1920.

Mr. Robert Garland, *Chairman,*
Trade and Commerce Committee,
Care of Garland Manufacturing Co.,
First National Bank Bldg., Pittsburgh, Pa.

Dear Sir:

Our attention has been called to the fact that a movement is under way to have the Pittsburgh Chamber of Commerce endorse the Meter-Liter-Gram system of weights and measures, and that this movement has come before your committee.

We would like to enter a protest against any such action being taken by the Chamber. There are many arguments both favorable and unfavorable to the decimal system of measures with which, we presume, you are thoroughly familiar and it is therefore not necessary to present these.

The position we take is that *so long as England and the United States adhere to the present system of weights and measures, the*

bulk of the commerce of the world will be done in these units, and that over a long period the old system has proved satisfactory and convenient and in no way interferes with the application of the decimal system for scientific purposes where it is eminently suited.

The particular point which we would call to your attention at the present time is that to adopt a new system of weights and measures will involve an enormous waste of tools and appliances, and require the manufacture of a complete new set of such tools and appliances at a time when all the available labor and production of this country and the world is greatly needed in making up the losses and destruction of the War. To adopt a new system at this time would have the same effect as to stop the entire production of the country for a considerable period of time, because a large number of toolmakers and machinists would be required for a long time in changing over the tool equipment of the various industries of the country, and it will certainly be agreed that at no time is this desirable, and particularly under present conditions.

To give an idea of the significance of such a change, take the case of our own company which, while large in our own line of business, is a very small item in the whole industrial production of the country. We would be compelled to change the lead screws and feed gears for all our lathes, purchase an entire new equipment of taps, dies and drills, as well as complete new equipment of micrometer and other measuring devices.

We have approximately 45,000 drawings, all of which would have to be retraced with changes to adopt them to the new standards of shaft sizes, threads and drills.

Many of our patterns would be useless and a very large equipment of jigs and templets which we use in machining work in the shops would all be discarded.

Without attempting to make any exact estimate of the cost of these changes, we would put them at close to $1,000,000 and every other manufacturer would be put to an expense in like proportion. From this you can see that the cost to the country at large would be an enormous sum of money and that the loss of effective production would be correspondingly great.

We request and sincerely hope that you will use every effort to prevent any action being taken by the Pittsburgh Chamber of Commerce which will, in any way, tend to advance this proposition. We believe that it is fostered by scientists and theorists who do not realize the enormous cost involved.

Very respectfully,

UNITED ENGINEERING & FOUNDRY CO., Pittsburgh, Pa.
(*Signed*) F. C. Biggert, Jr.,
President.

Mansfield, Mass., February 3, 1920.

American Machinist.
Attention Ethan Viall

Gentlemen:

We certainly are entirely opposed to the adoption of the metric system as a standard of measure in this country. As you probably know, we have, for foreign countries, manufactured taps and dies to the metric system for a great many years and we believe that we are without prejudice as regards the adoption of this system. We are sure that the greatest cost to the people in this country would be the cost of getting the people to think in the metric system.

Many years ago the writer endeavored in the shop, on a job where we were making metric tools exclusively, to get the workman to use the metric micrometers, but found the job too big for him.

As you probably know, every manufacturer of tools in this country who makes tools to metric sizes, translates the meter into the decimal equivalent of an inch.

To listen to some people talk about the metric system one would think that all that was necessary would be for Congress to adopt same. I believe if these same people had a fair idea of what it meant for a shop like ours to change over, they would not be any longer advocates of this system.

Yours truly,

S. W. CARD MANUFACTURING CO.,
W. B. McSkimmon,
Treasurer.

American Machinist.
Attention Mr. E. Viall, Editor

Gentlemen:

Replying to your letter of January 16th, we are decidedly against the use of the metric system, as it would not only *create industrial confusion for a long period of time but would cost thousands of dollars* for our company alone to change over, and there would be no advantage in it.

We are very decidedly against the adoption of the metric system.

Yours very truly,

MILLHOLLAND MACHINE CO.,
W. K. Millholland,
President.

New York, January 29, 1920

Hon. Peter J. Dooling,
15th Congressional District, N. Y.,
House of Representatives,
Washington, D. C.

Dear Sir:

Our attention has been drawn to a well-directed movement now under way to convince members of Congress that there is a real public demand for legislative adoption of the metric system of measurement in place of the English standard now in use. This movement, we understand, either has or shortly will be brought before Congress in the form of a bill to make the adoption of the metric system compulsory.

As manufacturers using machinery and quantities of machine tools in the production of our goods, we are strongly against such a change both from the point of our own interest and that of the entire industrial system, and we are writing to you, our Congressional Representative, to advise you of our attitude and to express the hope that you will do all in your power both officially and personally to defeat any such legislation.

It is probably unnecessary to elaborate details of the objections to a change in this country's system of measurement. Any one familiar at all with the manufacturing industry knows that it is based primarily on the use of machines and machine tools, and that under a legalization of the metric system all those now in use and in process of manufacture will be rendered worthless and the consequent stoppage of production in all lines of industry due to manufacturers being unable to obtain tools and machinery of the new standard would be nothing less than an industrial disaster, and a blow to American business interests, from which it would be the work of many years to recover. The machine-tool business is already overburdened and far behind in their orders, and a change to the metric system, such as proposed, would be an enormous costly proposition, and cripple the machinery builders for years.

We do not believe that there is any general demand for such a change from even a small proportion of the manufacturers of this country, who are after all the ones vitally interested.

From the standpoint of our own problem, the change would mean that an extremely valuable and modern factory equipment would be rendered almost useless, losing at a single stroke much of its value, and would practically wreck an established and prosperous business for at least a term of years; this disaster, of course, also extending to our numerous employees.

We cannot too strongly emphasize our unalterable opposition to any change in the present standards of measurement. We believe the adoption of the metric system, which could only become effective by compulsion, would, through its effect on industry, set the country back at least a decade commercially, and we wish to reiterate our hope that you will give this proposal your careful attention and do all in your power to prevent the metric system becoming standard by law.

Yours very respectfully,

SIMON ZINN, Inc.,
C. W. Hardy.

Brazil, Ind., January 30, 1920.

Hon. James E. Watson,
United States Senate,
Washington, D. C.

Dear Sir:

We have been advised that there is a well-organized movement under way to get a bill through at the next session of Congress making the metric system compulsory. We, as machine-tool builders, are opposed to the metric system for the following reasons:

1. Loss of all gages and working over all fixtures.
2. All drill bushings would have to be changed.
3. Confusion during the change over.
4. It would be necessary for workmen to be re-educated, as they have no conception of the metric system.
5. All micrometers and measuring instruments would be discarded.
6. All drawings would have to be made over.

We also wish to call to your attention that the present-day workmen and their children know absolutely nothing of the metric system and if it should be adopted it would be at least twenty-five years before the average workman could become thoroughly acquainted with the metric system.

In cold facts, we believe that any change in our system of measurement at the present would be such a handicap upon the American people that it would enable Germany to get on her feet again before we could recover from the change.

We can assure you that our employees, from the factory manager down to the

apprentice boy, are all against the adoption of the metric system.

Trusting that you will see that our interests are taken care of and assuring you that you have our co-operation, we beg to remain.

Yours truly,
WCCD TURRET MACHINE CO.,
J. W. Wood,
Secretary.

Rockford, Ill., January 20, 1920.

American Machinist,
Attention Ethan Viall, Editor

Gentlemen:

Your letter of January 16th is received. We will be very decidedly against any movement to make the use of the metric system compulsory. There would be a very large expense in changing our product and equipment therefor in order to accommodate this, and we do not believe that the results which might be expected would be at all commensurate with the cost of making the change.

There is bound to be a *long period of disruption* following an attempted change, which would take many years to overcome, if indeed it could be accomplished at all.

Yours very truly,
THE INGERSOLL MILLING MACHINE CO.
W. C. Sproul,
Secretary.

Hartford, Conn., January 19, 1920.

Mr. Ethan Viall, Editor,
American Machinist.

Dear Sir:

Relative to the existing movement designed to force a law through the next session of Congress, making the use of the metric system compulsory, we use and are familiar with the metric system from perhaps every angle.

During the war, in spite of the urgent requirements for speed, some divisions of the Ordnance Department considered it necessary to translate French drawings into English measurements. Where this was not done, many contractors, including ourselves, found it advisable to re-draw and translate to English measurements before it was considered safe to put the drawings into the shop.

We believe that any law making *compulsory* the use of the metric system in this country would be an economic crime.

Yours very truly,
PRATT & WHITNEY COMPANY,
B. H. Blood,
General Manager

Racine, Wis., February 9, 1920.

Mr. Ethan Viall.

Gentlemen:

Now that the metric system is up for another good airing let us look at it for a moment from the standpoint of a mechanic. What would it mean to the man of moderate wages, who has his tools all bought and perhaps had to pay for some of them on the installment plan? The tool kit of the average machinist is perhaps worth about $60.00 and of an average toolmaker more than double that amount.

In my own case, I have 82 inches in scales and steel rules in the English system and 78 inches of inside and outside micrometers. With the metric system the above mentioned tools would be rendered useless. In addition to that I would have to make an expenditure of close onto $100.00 for the same in the metric system, but with all this accomplished, then comes the transformation, "Oh, my brother machinist, ye must be born again."

Is there any man living with such a far-fetched imagination as to even dream what the confusion would be? For example some four or five years ago the manufacturers of this country changed from the V thread to the U. S. S.; it is needless for me to say how much confusion that caused. The trouble with the ¼ inch, 12 and 13 thread is not over yet.

The monkey wrench would be the most prominent tool in use for awhile, so would the "monkey machinist."

In conclusion, I must say that with the compulsory metric system the burdens placed upon the laboring man will be greater than he can bear.

J. A. RAUGHT,
1006 Grand Ave.,
Racine, Wis

Pittsburgh, February 2, 1920.

To the Editor:

In any system of measurements the "Unit of Length" is first chosen and the structure of the system is then built up around it. It is a curious fact that in the eighteenth century, before the advent of the metric system and before the introduction of transportation facilities, countries and even communities which were practically isolated from each other chose, in the overwhelming majority of cases, as their unit of length, "the Foot." True, these expressions of length were all different—some were longer, some were shorter—but they were all in the same catagory of the "foot," showing clearly its handiness.

When the French scientists imposed the "meter," roughly three and a third times as large a unit dimension, is it surprising that the old units show even now such a tenacity for survival?

The meter was supposed to be the 1/40,000,000 part of the earth's meridian circumference; this length being chosen as a fixed and unalterable dimension, which could always be measured again, should the exact length of the meter be lost. We know, of course, that calculations subsequent to the establishment of the meter proved the earlier conclusions to be incorrect, and this is the reason why the argument is no longer heard that the meter is a "logical" and always verifiable dimension of nature.

It would seem that, to be consistent to the metric idea, the French scientists should have divided the earth's meridian circumference by 100 million instead of 40. In that case the length of the meter would have been about 15½ in. But what they really did was to divide the circumference by the very un-decimal figure 4: i.e., they took the quadrant and divided it by 10,000,000. So the very origin of the meter is not based on the decimal idea.

The metric system was adopted in France by compulsory law in 1793. Nineteen years later, in 1812, Napoleon repealed this law and the old system was used again under the name "Systeme Usuelle" (the usual system). Twenty-five years later, in 1837, the metric system was again made compulsory. Today after eighty-three years it is *not* universally used even in France; the textile industries, for instance, use their own units. All French navigators use the English "Nautical Mile."

What is now called the metric system is but a fragment of that system as devised and understood by the promoters. The French law of 1837 omitted the decimal divisions of the year, of the day and of the circle.

The intrinsic quality which is necessary for any suggestion to be universally adopted is that of "handiness and convenience," because all human efforts follow the path of least resistance. Viewed in this light the metric units are either too large or too small to command general approbation of those who, rule in hand, actually use the system.

In our machine shops the workman using the English system in the building of machines, works to the one-thousandth part of an inch and its multiples as a limit, a dimension as readily and easily used as the inch itself by means of the micrometer.

Now:

(a) 1 mm. = 0.03937 in.
(b) 1/10 mm. = 0.003937 in. about 4/1,000th in.
(c) 1/100 mm. = 0.0003937 in. about 4/10,000th in.

Here again as a unit (b) is too large, while (c) is too small. Of course two and a half times one hundredth mm. is nearly one-thousandth inch, or 0.0009925 in., but what an unhandy unit this is for a man using his micrometer.

Another instance to illustrate the point made is found in the fact that in metric countries like France, Italy and Switzerland we find ½ kg. called a "pound."

The "decimal point" of the metric system, the so-called patent "cure-all" of all our troubles both real and imaginary, is nevertheless a very "shifty" customer, and responsible for many errors. The story ending with: "Damn that decimal point" has unfortunately too many applications.

In foreign trade a machine is sold on its merits; i.e., on its output, accuracy, handiness and first cost. The system of measurements to which it is built does not even play a secondary role.

In the manufacturing sections of "metric Europe" the English inch is as well known as any other dimension, it is reckoned with and made use of.

According to L. D. Burlingame, member National Screw Thread Commission, which met in Paris, France, in 1919, 80 per cent of the screw products of the world are now being manufactured on the inch system. There is very little standardization in this line in the countries using the metric system.

The arguments for the adoption of a new system are based on the assumption that the old units will disappear. As a matter of fact they never do. What is called the "adoption" of a new system is nothing more than its "introduction."

The introduction of a new system means simply the growth of a "dual" system with the perpetual necessity of converting from one to the other, and an inaccurate conversion at that in the majority of cases.

Much has been said in reference to the use of the metric system in the countries of Latin America, where in many of them it was "adopted" by law about sixty years ago. A survey of present-day conditions has shown that the English and Spanish units are still holding their own, with the natural consequence of inevitable confusion.

These few fragmentary notes are presented in the hope that they may stimulate an interest in the study of the subject.

Yours truly,
THE RITTMAN PROCESS CORP.,
C. C. Stutz.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

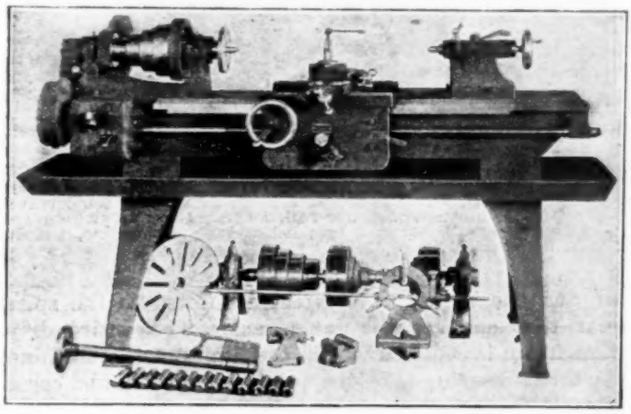
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Worcester Lathe with Quick Change Feed

Lathes manufactured by the Worcester Lathe Co., 100 Beacon St., Worcester, Mass., are now equipped with quick-change feed devices which are convenient to operate and which provide for twenty-four changes of threads and feeds.

The standard arrangement of gears as furnished will cut all threads from 4 to 30 per inch, except 29, and, in addition, several fractional threads such as 4½, 5½, 6½ and 7½ per inch. Four extra gears are furnished to cut various other threads ranging between 32 and 60 per inch. These gears are also used to cut 3, 11½ and 27 threads per inch. Special transposing gears can be furnished for cutting metric and other threads as required. They can be changed readily, when it is necessary to set up a different combination. The gears that are subject to the most wear are made from heat-treated steel.

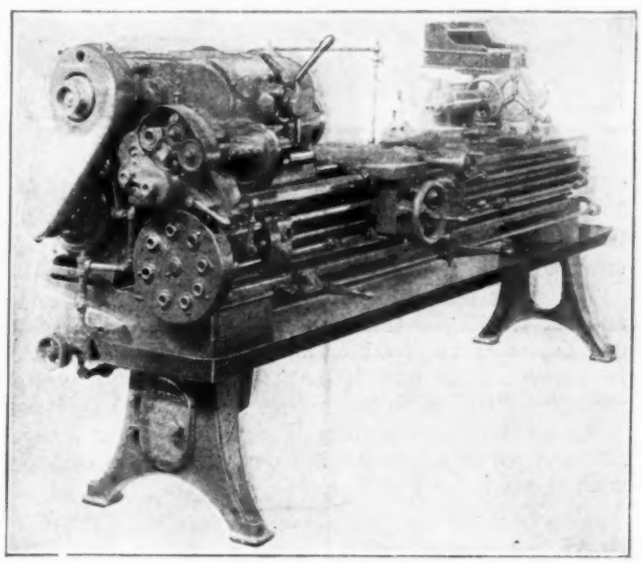


WORCESTER LATHE WITH QUICK-CHANGE FEED

"Ideal" Geared-Head Engine Lathe

The 14-in. x 8-ft. "Ideal" lathe illustrated has been greatly improved in design since it was described in Vol. 48 of the *American Machinist*. It is manufactured by the Springfield Machine Tool Company, Springfield, Ohio. It is motor driven and has rapid change gears, relieving attachment, taper attachment, oil pan and pump. A wood cabinet for holding small tools, etc., is a convenient provision.

The geared head is of the selective type having twelve mechanical changes of speed, and is provided with ball bearings throughout, with the exception of the spindle journals, which are adjustable and oiled by means of sight feed oilers. The oil passing through these journals is returned to the interior of the head, as the gears run in oil. The head is provided with two frictions. One of these engages through the back-gear train and the direct-drive gears and is operated by the long handle shown at the front of the headstock. This friction is used on all "Ideal" toolroom lathes, and is said to be of special value in the chasing of threads; as the back gears may be used for the cut and without disengaging the half nuts, the tool may be returned at a speed ten times as fast as the cutting speed. The second friction is used to start or stop the lathe independently of the running motor. It engages the sprocket that is inside the chain guard, and is controlled from two positions at the front of the lathe—one on the carriage, the other on the bed. The controlling levers may be seen extending forward from the lower lateral rod.



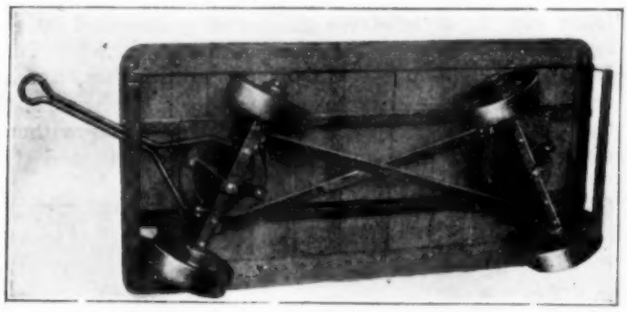
"IDEAL" GEARED-HEAD ENGINE LATHE

The relieving attachment will cut from two to twenty-six flutes per revolution of the spindle and will relieve right- or left-hand threads both external and internal. The relieving cam is provided with a cone friction in order that the operator may adjust the position of the relief. The rapid-change gear system permits forty changes of feed and the cutting of forty different threads. The upper screw shown is the lead screw and is used only for thread chasing. The rod below is for the feed. The bottom rod is for the automatic stop and reverse which controls both the feed and the lead-screw motions,

by means of adjustable stop collars. The lever at the right-hand side of the carriage pointed directly forward is for the purpose of controlling the right- and left-hand rotation of both lead screw and feed rod. The lubricant is conducted from the pump to the work by means of telescopic brass tubing. The pump may be seen just below the chain guard at the headstock, the reservoir being near by below the bed. The tailstock is of heavier design than formerly and all gears are well guarded.

W. & I. Sixth-Wheel Type Trailer Truck

The Warren & Irrgang Co., Springfield, Mass., has increased its line of industrial trailer trucks by several additional models. The one shown is designed for use in narrow aisles and for turning sharp corners. The bottom view shows the method used to steer with all four wheels. The truck is made in three stock sizes,



W. & I. TRAILER TRUCK

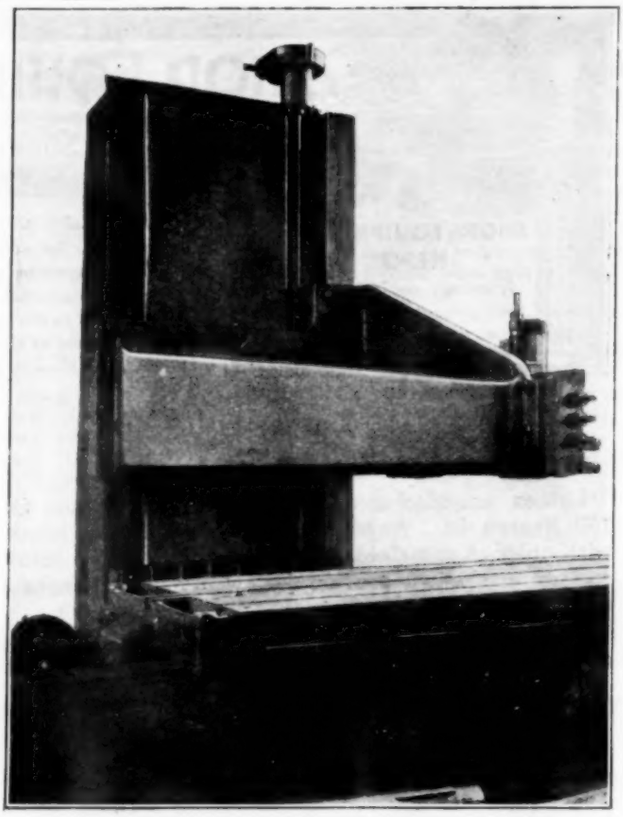
with capacities of two, three and four tons respectively. The 30 x 72-in. size has 12 x 3-in. wheels and will turn in a 4-ft. circle. The 40 x 120-in. size requires a 6-ft. circle to make the turn and has 14 x 3-in. wheels.

The truck is suitable for heavy and bulky materials and for trailing over rough floors and pavements. It can be towed from either end, an advantage when it is necessary to pull it out loaded from congested quarters. The castings throughout are of heavy pattern, and the iron wheels are furnished with or without rubber tires as required. All four wheels are equipped with Hyatt roller bearings.

Patch Open-Side Planing Machine

The F. R. Patch Manufacturing Co., Rutland, Vt., manufacturer of stone-working machinery, has of late years undertaken the manufacture of metal-working planing machines of both the open-side and double housing types. The cut illustrates a late model of the 48-in. open-side type and shows the structure of the crossrail and strut. The crossrail is of heavy box pattern with a bearing of 3 ft. on the front of the post and 2 ft. 3 in. at the rear. A feature in this connection is the corner grip on the housing for the rail brace, this holding the crossrail securely without impairing the alignment in any way.

The table is of the double-deck box type with stake holes drilled through the top deck only, and with openings at the sides for removing the chips. Three T-slots are provided; also four rows of 1-in. stake holes, spaced 1 in. apart each way. The advantage claimed for this type of table is that chips are entirely excluded from the ways. The drive consists of one pair of wide-faced spur gears, which are totally inclosed and submerged in



PATCH OPEN-SIDE PLANING MACHINE

Specifications: Planes, width, 48 in.; height, 48 in.; table length over all, 15 ft. 6 in.; width, 44 in.; length of bed, 23 ft. 4 in.; down feed, 9 in.; floor space length, including table travel, 32 ft.; maximum height under rail, 50 in.; horsepower required, 15 to 25; crossrail motor, 2 hp.; net weight of machine, without motor, approximately 40,375 lb.

oil, and one of which is direct connected to the spiral gear that engages the table rack. The entire drive mechanism is confined within the limits of the machine; the thrust bearing is on the outside of the bed and consequently is easily accessible. The spiral-gear bearings and oil reservoir inside the bed are piped to filler connections outside and the table need not be moved when filling them.

"Red E" High-Speed Lathe Centers

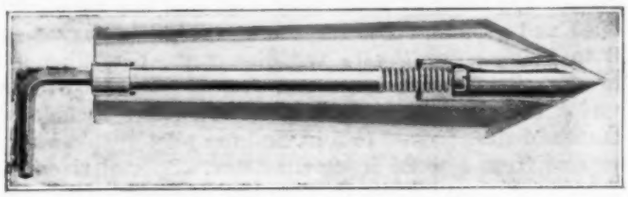
Lathe centers pointed with high-speed steel are being marketed by the Ready Tool Co., Bridgeport, Conn. The high-speed-steel point of each center is electrically welded to the nickel-steel body and extends back about one-quarter of the length, which is all that can be used

"RED E" HIGH-SPEED LATHE CENTERS

during the life of the center. The advantages claimed for these centers are long life; no tendency to burn or freeze to the work, and that a machine equipped with them can be run faster and more steadily. The center is made in all standard sizes and tapers, suitable for lathes and grinding machines.

Senn Improved Center

The Senn Tool and Machine Co., 90 Shelby St., Detroit, Mich., has introduced a center of the type illustrated that is suitable for a lathe or grinding machine. The body of the center is made from machinery

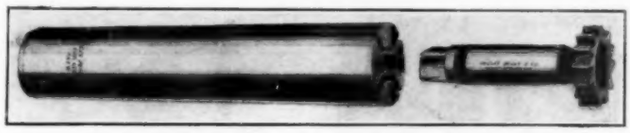


SENN IMPROVED CENTER

steel and is carbonized. The outside taper and collet hole are both ground to size. The collet is made from tool steel and is hardened and ground. The screw is of cold-drawn steel and is cyanided. The center point is of high-speed steel and is heat-treated. A small socket wrench is furnished with each center. The center is manufactured in all standard sizes and tapers, and the parts are said to be interchangeable.

"Wear Ever" Chucks and Cutters for Woodruff Keyways

Scully-Jones & Co., Railway Exchange Bldg., Chicago, Ill., is marketing collet chucks and keyway cutters of the type shown in the illustration. The combination is



"WEAR EVER" CHUCKS AND CUTTERS FOR WOODRUFF KEYWAYS

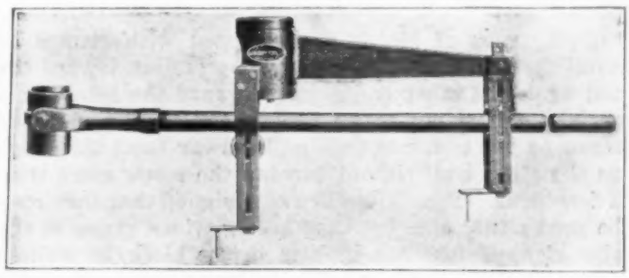
designed especially for the milling of keyways for Woodruff keys. The chucks are hardened and ground and can be furnished to fit all standard tapers. The Woodruff cutters have squared shanks and are furnished in all standard sizes to fit Woodruff keys.

"Liberty" Bottom Riveting Rig

The riveting rig illustrated is a useful accessory to a pneumatic riveter when driving rivets in the bottom of ships. It is a product of the Liberty Tool Co., Munsey Bldg., Baltimore, Md. When used for ship riveting it is attached to the ship's bottom by a single bolt that passes through the center swivel bracket. The riveter is held at the end of the radius arm in the cylinder bracket which is supported in a yoke and adaptable to any make of riveter. When placed in the bracket it is held securely by a neck ring that is fastened by set screws. It rests upon a coil spring that is inside of the bracket, this being for the purpose of holding the riveting hammer against the rivet. The round radius arm is supported at two points upon convex rollers which are mounted in crossheads. These may be screwed up or down by the crank handles at the ends of the brackets.

The operator is not required at any time to support the weight of the riveter, as it will slide the full distance allowed by the radius arm and will cover all parts of a 20-ft. circle. The riveter has a full universal movement; also a vertical adjustment of six inches. The latter is necessary when riveting the keel plate which projects about 1½ in. below the ship's bottom.

At the sides, stern and bow where the bottom turns up to the shell, the universal adjustment feature allows

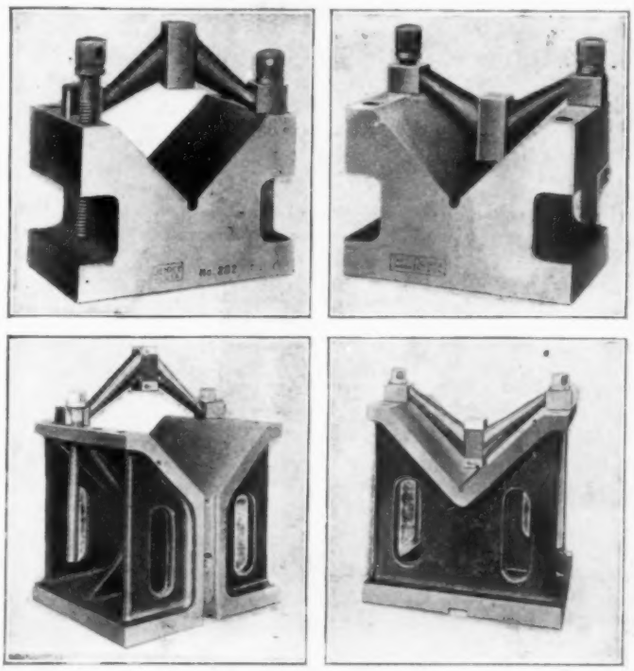


LIBERTY BOTTOM RIVETING RIG

the hammer to be set at the proper angle to drive rivets not on a straight line with the bottom. The device ordinarily works on a radius of 10 ft. and is operated by one man, but another man is of course required on the inside of the ship to hold against the rivet. The yoke on the end of the radius arm is tapped for 1½-in. standard pipe so that it can be equipped with any length of radius arm that may be required between shores under ships. A full-length radius arm is furnished with each rig.

Taft-Peirce V Blocks

The Taft-Peirce Manufacturing Company, Woonsocket, R. I., has introduced a line of V-blocks for machine-shop use. These are made in two styles, as illustrated; the solid type in the 4-in. size and the skele-



TAFT-PEIRCE V-BLOCKS

ton type in the 6- and 8-in. sizes. These three sizes are intended to meet all conditions met in shop practice.

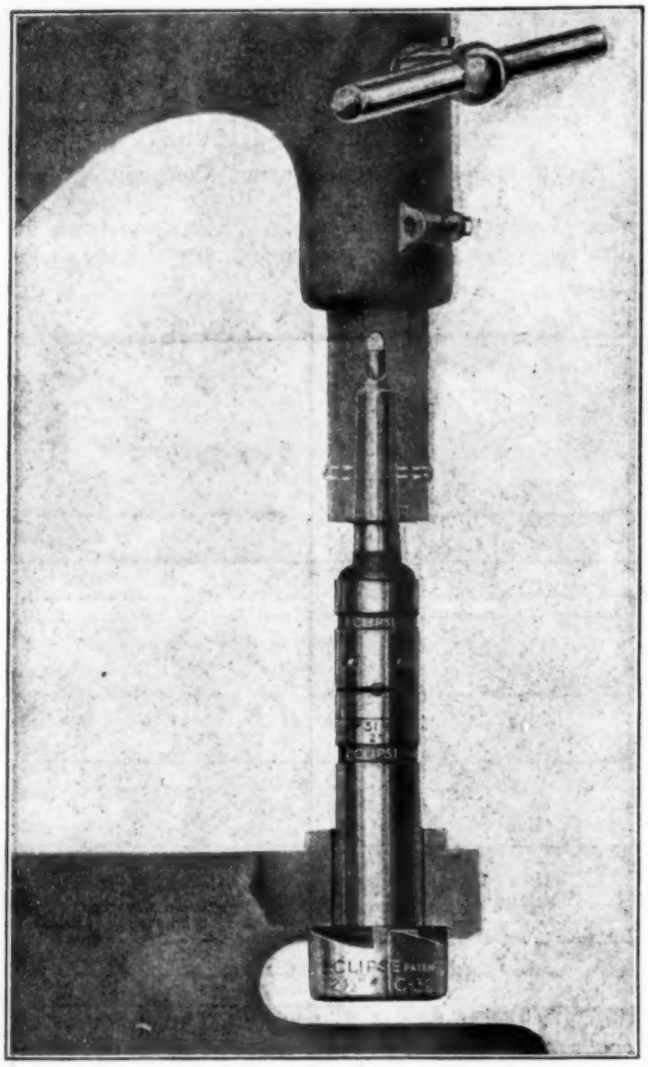
The blocks are furnished in pairs. In each case the

V is central with the sides. The 4-in. block is made of tool steel, hardened and ground on all external surfaces. The sides are undercut in such a way as to permit the use of clamps for holding the blocks in place. The 6- and 8-in. sizes are provided with a slot in one end and in the base, as well as one bolt hole in the base and one in the end, for the purpose of clamping the blocks in place.

Both types of blocks are equipped with clamps of novel design. One end of the clamp is open toward the end while the other end is open toward the side. This permits the clamp to be swung out from under the screw on one end, and then pulled away from the screw on the other end without turning the screw more than a few turns. The clamps are so designed that they may be used either side up, thus giving wider range to the size of work that can be held in the block, as well as decreasing the amount of adjustment necessary with the clamping screws. All blocks are equipped with four clamping screws and two clamps.

"Eclipse" Interchangeable Counterbore

The counterbore illustrated serves a double purpose, as it can be used for either counterboring or back-counterboring. The holder provides means for quickly changing cutters and pilot shanks without removing the holder from the machine. These counterbores are furnished with either straight or taper shanks. The shanks are left soft so they can be fitted to the spindles or chucks of the machines in which they are to be used. The cutters are made of high-speed steel. The pilot shanks are made of machinery steel and are pack-hardened and ground. The lengths of the pilots vary from 3 to 6 in., according to the diameter. The diameter of the pilot section is ground from 0.004 to 0.010 in. under the size stamped on it. The cutters include all standard sizes from ½ to 5 in. and the pilot shanks range in size from ¼ to 2½ in. in diameter. Special sizes are furnished when required. This line of tools is the product of the Eclipse Interchangeable Counterbore Company, Inc., Detroit, Mich.



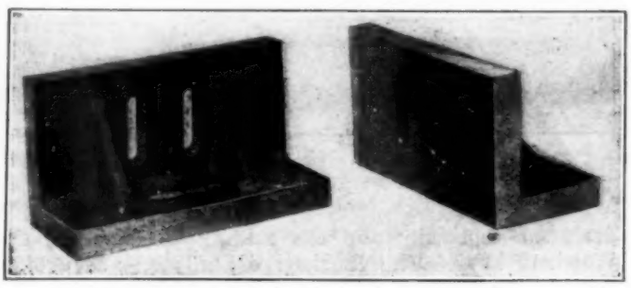
ECLIPSE INTERCHANGEABLE COUNTERBORE

Taft-Peirce Slotted Angle Irons

The Taft-Peirce Manufacturing Company, Woonsocket, R. I., has standardized a set of angle irons for the following series of sizes:

First Angle	Length (Inches)	Second Angle
4	5	5¼
6	6	8
4	9	5
8	10	12
5	12	6
9	12	10
12	16	14

These slotted angle irons are especially designed for use on milling, planing, boring, and drilling machines. The combination of dimensions has been selected to meet as wide a range of conditions as possible with a minimum number of sizes.



TAFT-PEIRCE SLOTTED ANGLE IRONS

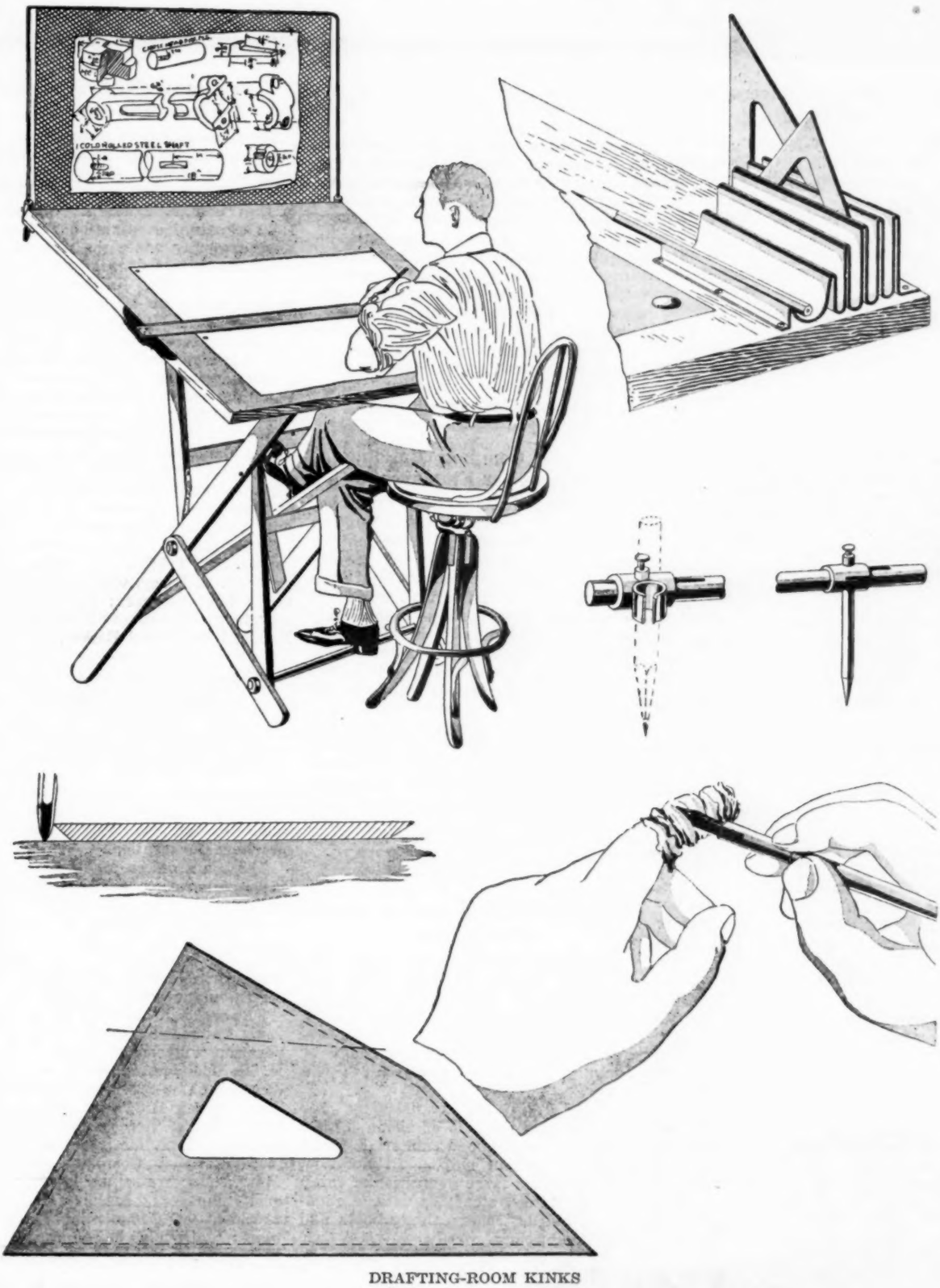
Slots are provided clear through both faces, the slots being located at right angles to one another. The webs are cast well back from the edge, and therefore do not interfere with the use of clamps. The faces are accurately finished so as to be square with each other. In the small sizes the angles are ground and in the large sizes they are planed.

Snow & Petrelli Reversing Gear

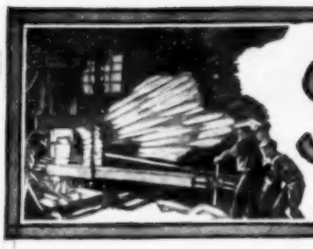
In the article entitled "Snow & Petrelli Reversing Gear," on page 897, Vol. 51, it was incorrectly stated, "the gear is built in four sizes with capacities ranging from 9 to 52 hp., according to size." It should have been "the capacities range from 9 to 52 hp. per 100 r.p.m." This error apeared also in the Condensed Clipping Index, page 268c, Vol. 52. We request all of our readers who intend keeping their copies for reference to make this change.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas



DRAFTING-ROOM KINKS



Sparks from the World's

By E. C. Porter,

Mohawk Valley Engineers' Club Organized

On Wednesday evening, Jan. 7, 1920, about 125 engineers, architects and chemists gathered at a dinner at the Hotel Utica, Utica, N. Y., and organized the "Mohawk Valley Engineers' Club."

The membership of this club includes mechanical, civil, chemical, electrical, mining, textile, heating and ventilating, automotive and all technical engineers and architects. The club will have regular monthly meetings on the first Tuesday of each month, and special meetings intermediate between these times will be selected. The officers for the first year are: Byron E. White, president, engineer, Utica Gas and Electric Co.; Hubert E. Collins, first vice president, consulting engineer; Roy F. Hall, second vice president, division engineer, State Highway Department; Horace B. Sweet, third vice president, consulting engineer; Frederick E. Beck, secretary, engineer of Consolidated Water Company; Clifford Lewis, treasurer, civil engineer.

The territory embraced by the activities of the club includes a radius of approximately forty miles from Utica and it is expected that the membership of the club may reach the 200 mark.

Engineering Research Vacancies at the University of Illinois

To assist in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen research graduate assistantships in the Engineering Experiment Station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $500 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry.

An appointment to the position of research graduate assistant is made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred.

The Engineering Experiment Station, an organization within the College of Engineering, was established in 1903 for the purpose of conducting investigations in the various branches of engineering, and for the study of problems of importance to engineers and to the manufacturing and industrial interests of the State of Illinois. Research work and graduate study may be undertaken in architecture, architectural engineering, ceramic engineering, chemistry, civil engineering, electrical engineering, mechanical engineering mining engineering, municipal and sanitary engineering, physics, railway engineering, and theoretical and applied mechanics.

Additional information may be obtained by addressing the director, Engineering Experiment Station, University of Illinois, Urbana, Illinois.

Machine Company Building Homes for Employees

The New Britain Machine Company, New Britain, Conn., is contemplating the construction of ten houses on the company's property near the factory being used for the manufacture of shop fixtures. It is probable that work will be started this spring, immediately after the completion of the five homes which were started some months ago. They are two-tenement frame buildings and the additional homes will be on the same plan.

The company's purpose in erecting homes near the factory is to provide rents for the families of the employees. It is the company's intention to rent the homes as soon as they are ready, and if the employees want to purchase their own home they will be allowed to do so on easy terms.

Surplus Material Sold by Navy Department

The sales board of the Navy Department during January, 1920, sold $13,975,272 of surplus material and equipment, according to the monthly report of the chief of the sales section. For the twenty-six working days of January, the sales averaged $499,068 a day.

Included in the transactions for January was the sale of about $27,000 worth of condemned material taken from ex-German ships. In addition, the Navy sold large quantities of scrap iron and steel, steam engines, a number of old destroyers, flying boats and airplane engines.

At the rate the Navy has been selling its surplus material it is expected that the entire supply will be disposed of within a year.

The Frasse Steel Company Reconstructs Its Plant

The Frasse Steel Company has completed plans for the reconstruction of its present plant in Connecticut. This new company took over the business of the Peter A. Frasse Company, Jan. 1. The parent corporation was a New York company while the new concern, which markets the greater part of its products in New England, is incorporated under the laws of Connecticut.

The additions to the plant will comprise an extension of the present shop building, which will be 320 x 25 ft., and a building in front of the present office, the first two stories of which will be 175 x 90 ft., while the third story is to be 75 x 90 ft. On the railroad side of the plant there is now a loading platform 320 x 40 ft., which, under the new plans, will be inclosed to provide more storage space for both raw material and for finished products.

The directors of the new Connecticut corporation are: A. E. Brion, president; R. C. Stacy, vice president; Lester Brion, treasurer; R. K. Newman, secretary; Theodore Hager; Arthur B. Mead, and Fred Becker.

Reorganization of the P-W-V Automatic Machine Corporation

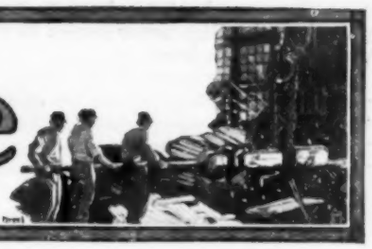
The Springfield Automatic Screw Machine Corporation has been organized under the laws of the State of Delaware with a capital of one million dollars to take over all the assets and liabilities of the P-W-V Automatic Machine Corporation.

The main offices and factory of the new corporation will be located in Springfield, Mass. The construction of a new factory building will be started as soon as the weather will permit. The new corporation will retain its present factory in Fitchburg, Mass., for the manufacture of small parts.

The board of directors of the Springfield Automatic Screw Machine Corporation will consist of the following: M. A. Coolidge, chairman of board of directors; Chas. E. Van Norman, president; Frank H. Page, vice president; L. M. Waite, vice president and sales manager; I. T. McGregor of the Commercial Trust Company, Springfield, Mass.; C. J. Wetsel, secretary and general manager; Arthur H. Skinner, president of Commercial Trust Company; H. Douglas Williams of Watson-Williams Company, Boston, Mass.; Ashton Carr, State St. Trust Company, Boston, Mass.; and Alton F. Tupper, attorney, Boston, Mass.

Industrial Forge

News Editor



Contributes $5,000,000 to Scientific Institutions

The Carnegie Corporation of New York has announced its purpose to give $5,000,000 for the use of the National Academy of Sciences and the National Research Council. It is understood that a portion of the money will be used to erect in Washington a home of suitable architectural dignity for the two beneficiary organizations. The remainder will be placed in the hands of the Academy, which enjoys a Federal charter, to be used as a permanent endowment for the National Research Council.

The council is a democratic organization based upon some forty of the great scientific and engineering societies of the country, which elect delegates to its constituent divisions. It is not supported or controlled by the Government, differing in this respect from other similar organizations established since the beginning of the war in England, Italy, Japan, Canada and Australia.

The council was organized in 1916 as a measure of national preparedness and its efforts during the war were mostly confined to assisting the Government in the solution of pressing war-time problems involving scientific investigation. Reorganized since the war on a peace-time footing, it is now attempting to stimulate and promote scientific research in agriculture, medicine, industry and in every field of pure science.

Joint Meeting on Aluminum

G. M. Rollason of the Aluminum Manufacturers, Inc., read a paper on "Alloyed Aluminum as an Engineering Material," on Tuesday, Feb. 10, before a joint meeting of the American Society of Mechanical Engineers, Metropolitan Section; Society of Automotive Engineers, Metropolitan Section; and the New York Section of the American Institute of Mining Engineers. The paper was illustrated by lantern slides showing charts, microphotographs and a few applications of the alloy to automotive parts.

Among other things brought out were the high tensile strength after heat treatment of the alloy known as "Duralumen," its remarkable resistance to fatigue and its low specific gravity compared to the steel drop forgings which it can replace for certain work.

Lawrence Addicks of the Mining Engineers presided; and, upon the conclusion of the main paper, called upon Mr. Pack, of the Doehler Die-Casting Co., for a few remarks on the die-casting of aluminum, and on Mr. Trewin, of the New Jersey Zinc Co., for information on the alloying of aluminum and zinc. Mr. Pack pointed out the difference between die-casting and casting from permanent molds and remarked that the development of aluminum die-casting dated from the outbreak of the war. He had a number of interesting samples of the work of his company ranging from a Lewis gun part to one for a milk separator.

Mr. Favary of the Automotive Engineers mentioned some of the factors to be taken into account in the design of internal combustion engines using aluminum alloy pistons and connecting rods.

Questions from the floor concerning the welding and soldering of aluminum were answered by Dr. Blau of the Aluminum Company of America. He said that so far as he knew electric welding had not been successful but that gas welding by any of the well-known methods would produce good results after the acquisition of a certain amount of technique by the operator. As to soldering there were several compounds on the market that would stick two pieces of aluminum together but the difficulty was to keep them together as the joint was very susceptible to electrolytic action.

Belgium's Industrial Recovery

In a recent booklet on the subject of Belgium's industrial recovery, D. L. Blount, recently director-general of the Central Office of Information, Ministry of Economics of Belgium, places the following estimates on resumption of industry: Coal mines, 94 per cent normal; refined sugar, 100 per cent; cotton spindles in operation, 75 per cent; cotton looms, 60 per cent; wool products, 75 per cent; shoes, 70 per cent; window glass, 34 per cent; plate glass, 36 per cent; steel mills, 30 per cent, while twelve blast furnaces are now producing 10 per cent of the output of the fifty-four blast furnaces in operation before the war.

Of the machinery taken away during German occupation, 5,069 pieces out of 9,797 have been recovered. The agricultural production in 1919 surpassed the average for the years just preceding the war, the yield of wheat, oats, barley, and rye having been particularly good. In the light of the unfavorable reports current in the newspapers regarding conditions abroad, this showing of Belgium is very encouraging. It warrants the hope that a return to normal will not be so long deferred as we have been led to expect.

First Annual Mechanical Inspection Exhibition

The first annual exhibition of mechanical inspection equipment was held on the Hotel Astor roof, New York City, Feb. 2 to 6, inclusive, 1920. Attendance at a very interesting collection of exhibits was somewhat limited by the severe weather and traffic tie-ups. Those who went, however, were well repaid for their efforts.

Exhibits were presented for inspection by United States Bureau of Standards, American Society of Mechanical Inspectors, William Brewster Company, Inc., Coats Machine Tool Company, Inc., College of the City of New York, Greenfield Tap and Die Corporation, Holz and Company, Incorporated, Inspection Engineering Equipment Company, C. E. Johansson, Incorporated, Arthur Knapp Engineering Corporation, New York Testing Laboratories, Pratt & Whitney Company, Shore Instrument and Manufacturing Company, Inc., The Inspector Publishing Company, The Industrial Press Publishing Company, West & Dodge Manufacturing Company, Wilton Tool and Manufacturing Company, Jones & Lamsen Company.

The Machine Outlook in Mobile

The effect of the increased prices of machine tools has, according to dealers in the Mobile district, almost shut off the demand for them in this locality. There being no machine manufacturing the uses were for the repairing of other machinery such as saw mills and the various kinds of ship repairs.

The large saw mills in many cases had quite complete repair shops for handling their own breakdowns and replacements. A lathe, shaping machine, drilling machine and sometimes a radial drilling machine were to be found in almost all saw mills, while the larger mills added to these an occasional planing machine and perhaps two or more lathes.

This equipment is, however, not being added to at present prices. If their own repair shops cannot handle the breaks, the piece is sent to some repair shop which can—not that these shops have any new equipment, but simply more of it, and the saw-mill man does not know how poor its condition may be. Machine tools never wear out—they get old and loose in the joints (instead of stiff as with a human) and the length of time they can be run depends on the sensitiveness of the user. True, they can be rebuilt and rebushed and this is sometimes done. Usually, how-

ever, they are kept too busy to be repaired or the time never seems to come when it can can be done.

Ship building and ship repair demanded and secured quite an addition to the machine equipment of this section. This leaves the shops engaged in that line of work in good condition to handle the work that is coming from all parts. This includes oil tankers of the various companies which trade in Mexico and Texas; and, at this writing, a Dutch tug with a Chinese crew, all the way from Ceylon, is tied up for extensive overhauling. She towed a barge to Tampico and then ran to Mobile for repairs.

Local dealers do not see much of a market for machine tools in this section as long as present prices prevail, or until the need becomes imperative from various causes. General business, however, is excellent and they see no sign of a let-up during this year at least. As long as the machine-tool men are behind with their orders, the lack from this section, which is small at best, is not likely to prove very serious. The railroad shops in this section are sadly in need of new machinery. But this has been true for so long that it has become a habit and cannot be ascribed to war conditions in any way. Wheel lathes that date back forty years are not just the best equipment to handle the large drivers of the present day.

Automobile repair shops would seem to offer quite a field for a lot of small machinery. But a visit to a few of them soon dispels this illusion. With the exception of the Ford service stations, which require a minimum of repair equipment, the average garage repair shop might almost as well have been in the Garden of Eden.

An oxy-acetylene outfit, which is of course modern, a decrepit drilling machine and a few files and wrenches seem to complete the average outfit. Scored cylinders are filled by the oxy-acetylene torch and after a half-round file gets off most of the surplus metal, an old piston, split so as to expand readily, serves as a lap. The Fairbanks Company has a special department for garage machinery and appliances, which may improve these conditions, but they are not alluring to the average machine builder at the present time.

This is not a country of machine-tool equipment and the field does not promise much expansion in the near future.

Industrial Review of English Conditions

A year ago there seemed a very good prospect of numerous new models of tools which had been lying dormant making their appearance within a measureable time. As a matter of fact very few of them have made their appearance. Machinists were fully occupied as long as they could get castings in trying to overtake the demand for standard tools. The enforced idleness due to the molders' strike, so far from being available for giving concrete form to new ideas, has further postponed developments, for it is not possible to make much progress without the help of the foundry.

The hitches in the negotiations which prevented preparatory work being put in hand at the deserted foundries when the year opened have added seriously to the difficulties of the position. If saner counsels had prevailed when the negotiations were re-opened the foundries might have been in full swing again by this time, but much work remains to be done now before anything like capacity production can be restored. All the normal activities cannot be suspended for four months without involving a great deal of repair work, to say nothing of the preliminaries which in any case are necessary to bring the plant back into operation. Meanwhile the hold-up in dependent industries grows more disastrous. There are a lucky few who have not used up all their stocks, and light castings have been obtainable to a limited extent from the foundries which were not quite closed down by the strike, but it has been impossible to make any general progress. Makers of small machine tools could get heads and sometimes a few beds, but these were not of very much account without the legs and pans. In the same way the automobile factories could get some details, but they could not balance with cylinders and pistons, and though firms persevered in their endeavors to keep down unemployment to the minimum it was a very doubtful advantage from a production point of view, for it will entail uneconomic makeshift expedients till castings are forthcoming to redress the inequalities. Good progress is being made with a further extension of Taylor & Challen's establishment, Birmingham, the large block abutting on Constitution Hill and Henrietta St. now being built upon providing a considerable amount of additional floor space. Buck & Hickman, Ltd., Birmingham, will shortly remove on expiration of lease from the premises it has occupied in Station St. to a site in Newton St. The National Projectile Factory, at Dudley, has been acquired, by private treaty, by the firm of Harper Bean, Ltd., which will equip it for automobile work and general engineering in connection with its scheme for a united system of production embracing almost all departments of automobile construction, from raw material up to the complete machine. The factory with its equipment costs nearly a million pounds. Most of the plant has been disposed of under the hammer. With regard to the National Factory, at Blackheath, for which conditional offers were made by several engineering firms, it is now in contemplation to devote it to training disabled soldiers.

Among the new factories which are being built in Birmingham are several which are to be devoted to the extension of the jewelry industry, and firms like Brown and Ward, Ltd., have a number of orders on hand in this connection, production in certain branches of the jewelry trade being in process of re-organization on new lines in which machinery will play a prominent part.

The Best Land

If I knew a better land on this glorious world of ours
Where a man gets bigger money and is working shorter hours,
If the Briton or the Frenchman had an easier life than mine,
I'd pack my goods this minute and I'd sail across the brine;
But I notice when an alien wants a land of hope and cheer
And a future for his children he comes out and settles here.

Here's the glorious land of Freedom! Here's the milk-and-honey goal
For the peasant out of Russia, for the long-subjected Pole;
It is here the sons of Italy and men of Austria turn
For the comfort of their bodies and the wages they can earn,
And with all that men complain of and with all that goes amiss,
There's no happier, better nation on the world's broad face than this.

So I'm thinking when I listen to the wails of discontent
And some foreign disbeliever spreads his evil sentiment
That the breed of hate and envy that is sowing sin and shame
In this glorious land of Freedom should go back from whence it came,
And I hold it is the duty, rich or poor, of every man
Who enjoys this country's bounty to be all American.

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Three Worcester Firms Maintain New York Headquarters

The Reed-Prentice Co. and the Whitcomb-Blaisdell Machine Tool Co. of Worcester, and the Becker Milling Machine Co., Hyde Park, Mass., are maintaining headquarters for their export business at 24 Stone St., New York. The Reed-Prentice Co. is sending abroad its lathes and drilling machines, the Whitcomb-Blaisdell Co. its engine lathes and planing machines, and the Becker Co. its line of milling machines.

Trade Currents From New York and Cleveland

NEW YORK LETTER

The first two weeks of February ended with all lines of machine tools active, and the dealers enjoying a run of exceptionally good business.

As the machine-tool export center, New York is watching closely the fluctuations of the exchange market. Since the sharp decline of sterling last week, machine-tool exports—except to South America and the Far East—ceased abruptly, and will remain inactive until rates better themselves.

Some exporters see so little hope of improvement in the situation that they are recalling their foreign representatives. Still others are cancelling European agencies, and turning attention to the countries whose exchange is quoted favorably.

With the approach of spring, the shipyards are coming into the market for various tools. Pneumatic equipment leads the inquiries with plate-making equipment second. Most shipyards in the New York district have contracts for all the tonnage they can care for.

The great blizzard last week was a factor in slowing up deliveries of machine tools. This, together with freight embargoes, practically halted machine-tool deliveries in and about New York for over a week.

Some increase in the demand for used machine tools has been noted on the part of consumers who heretofore bought nothing but new equipment. Dealers ascribe this to slow deliveries of new tools, and now state that even slower deliveries will be the rule from now on. Six to nine months is considered good in most lines.

There is no change in the characteristics of orders. Single tools still make up the bulk of the machine-tool business. One concern, however, bought twenty-five tools in one order, and another took fifteen.

The next two weeks promise to have a quiet tone, and a big change in the market has been predicted for the early part of March by dealers who have been closely in touch with the situation.

CLEVELAND LETTER

Markedly unsettled conditions have developed in the Cleveland and Central West machinery trade since official Washington has started the prediction for a slump in prices on commodities. This condition has been augmented still further by the sharp decline in foreign exchange rates, the tightening of credit and the break in stocks.

The result is that the last week finds the machinery interests in a quandary as to what the immediate future will bring forth, and the older members of the trade are disposed to compare present conditions with those that preceeded the financial upheaval in 1907.

The most significant factor making for this contention is that sales representatives both at home and in the field already feel the hesitancy that made its first appearance in this locality late in January. They report that many orders remain unfilled, although there is the consolation that they are not being cancelled. It is admittedly too early to know just what the break in the foreign exchange rates will mean for the machinery industry and all export business, for that matter. Nevertheless in some firms advices have been received from representatives, who have been abroad looking over the European fields, stating that they are coming home, seeing no good in remaining away at this time. The first-handed information they will bring with them is expected to offer a working basis on early future operations here.

Latest figures by the Federal Industrial Census will show that Cleveland leads the world in the production of automobile parts, exceeding even Detroit, and in addition that it is turning out 100,000 completed automobiles each year. A large number of cars are being made in Cleveland and assembled in Detroit, according to Dale Brown, secretary of the Automotive Association of the Cleveland Chamber of Commerce.

V. C. Kylberg Resigns from Machine-Tool Section of War Department

V. C. Kylberg, former assistant chief of the machine-tool section, Office of the Director of Sales, War Department, resigned from that position Feb. 1 to become associated with a large machine-tool concern in an executive capacity.

Coming to the machine-tool section in March, 1919, when it was first organized to dispose of large quantities of machine tools owned by the War Department and which had been declared surplus, Mr. Kylberg was largely responsible for many of the policies and practices adopted by the section which later resulted in large Government sales of machine tools.

At the time of his resignation, he was handling the sale of machine tools to educational institutions as prescribed by the Caldwell Act.

Although Mr. Kylberg's successor has not yet been announced, it is probable that J. M. Bowlby, acting chief of the section during the absence of A. A. Fuller, chief, will be selected to fill the vacant position.

Changes Back to Old Name

The Cleveland Osborn Manufacturing Co., Cleveland, Ohio, manufacturer of industrial brushes, brooms and foundry molding machines, has changed back to its old name, the Osborn Manufacturing Co. The main office and factory are located at 5401 Hamilton Ave., Cleveland, Ohio. Branch offices and warehouses are maintained in New York, Detroit, San Francisco, Milwaukee and Chicago.

Applications for Machine Tools from Educational Institutions

About 800 applications have been received by the Office of the Director of Sales, War Department, from educational institutions in the various states, which are entitled to purchase machine tools from the Government under the Caldwell Act.

Applications have been received from every state, in addition to the District of Columbia and Hawaii. California is leading the states in the number of applications, while New York ranks second and Pennsylvania and Washington are tied for third place.

The number of educational institutions in each state which have already made application to the Director of Sales for machine tools are:

Alabama	13	Nevada	2
Arkansas	10	New Hampshire	7
Arizona	6	New Jersey	21
California	92	New Mexico	11
Colorado	8	New York	74
Connecticut	14	North Carolina	4
Delaware	2	North Dakota	9
Florida	6	Ohio	59
Georgia	9	Oklahoma	7
Idaho	5	Oregon	5
Illinois	21	Pennsylvania	62
Indiana	16	Rhode Island	3
Iowa	13	South Carolina	7
Kansas	28	South Dakota	3
Kentucky	7	Tennessee	10
Louisiana	3	Texas	13
Maine	3	Utah	3
Maryland	3	Vermont	2
Massachusetts	37	Virginia	15
Michigan	30	Washington	62
Minnesota	15	West Virginia	6
Mississippi	2	Wisconsin	25
Missouri	8	Wyoming	6
Montana	7	Dis. of Columbia	11
Nebraska	5	Hawaii	1

A Menace to American Industry

We are doing everything we can think of to bring home the meaning of compulsory metric legislation to the average American. We have commented editorially, we have printed many strong letters from leaders of the machine tool industry and we have sent reprints of these broadcast. In this issue is a cartoon insert which emphasizes the danger in a cruder, more spectacular and perhaps more telling way We have not bound it in so that it can be put up in a prominent place to spread its message to all beholders.

Westinghouse Opportunities for Technical Graduates

Westinghouse opportunities for technical graduates are explained in an illustrated pamphlet bearing that title, recently issued by the Westinghouse Electric and Manufacturing Company.

This booklet describes the plan which has been developed by this company for the training of the graduates of technical schools at all of its various works. In the booklet is included a list of Westinghouse men who originally entered the company as graduate students, as well as a list of schools from which students have entered the employ of the company.

Copies of the booklet will be sent to anyone interested on application to the educational department of the company at East Pittsburgh.

Business Items

The Risdon Tool and Machine Company, Naugatuck, Conn., has changed its name to the Risdon Manufacturing Company; there is no change in the personnel of the company.

The Lambert & Co., Mexico City, has been appointed representative of the Hart-Parr tractor for Mexico. The Hart-Parr Company recently made a carload shipment of tractors to the Lambert Company.

The Lindstrom Tool, Die and Gage Works, Inc., 50 Silliman Ave., Bridgeport, Conn., has changed its name to the Lindstrom Tool and Toy Co., and will manufacture its tools, gages, dies, etc., in the same plant.

Bennett and Seeley, Inc., Bridgeport, Conn., has been organized to deal in mill and foundry supplies, etc. The incorporators of the new company are F. A. Bennet and E. B. Seeley. The capital of the concern is $50,000.

The Sherritt & Stoer Co. has announced the opening of its new office, storeroom and warehouse at 2006-2008 Market St., Philadelphia, Pa., where it will maintain an exhibition of machine tools, railway and machine-shop equipment.

B. J. McBride, George B. McClennen and Andrew I. Meahan have purchased the business of the Delta Electric Co., Philadelphia, Pa., and will conduct a business of buying, selling and repairing electric motors and generators and will develop departments for new and used boilers and machine tools.

The Fairbanks Co., Broome and Lafayette Sts., New York, has been given the distribution of the Lincoln electric motors for industrial purposes. This line includes alternating-current motors for two- and three-phase circuits in capacities from ½ to 500 hp.; also direct-current motors from ¼ to 150 horsepower.

The Tacony Steel Co., Philadelphia, Pa., has announced the opening of a Chicago office which will be located in the Marquette Building. Frank B. Millwick, formerly with the Bethlehem Steel Company and the Crucible Steel Company, will be district sales manager for this branch. Mr. Millwick is a member of the American Steel Treaters' Society.

The Peerless Foundry and Machine Co., of Atlanta, Ga., is moving to Chattanooga, Tenn., where, it is understood, that this company will establish a foundry and machinery plant. The company has rented quarters for the present but makes the announcement that it intends to build a plant of its own in the near future. F. L. Marco is the president of this company.

The Lilliston Harvester Co., Albany, Ga., has been incorporated by J. H. Lilliston, Suffolk, Va.; C. J. Rambo and J. M. Webb, both of Edison, Ga. It is understood that this company will establish a plant at Albany for the manufacture of peanut pickers, and will also operate in connection with this plant a machine shop and foundry. It is announced by the company that it will later manufacture gasoline engines and thrashing machines.

The Road Gripper Tire and Rubber Co. will locate in Mason City, Ia. This company was recently incorporated under the Minnesota State laws by F. W. Bozendahl, president, and Fred. Trahms, secretary. This company will give employment to about 300 men. For the present it will occupy a part of the former Colby motor plant and will manufacture automobile tires, inner tubes and rubber heels.

The Service Engineering Co., 25 Church St., New York City, has been incorporated under the laws of New York State. This company will conduct a general engineering service business and will specialize in the design of tools, jigs, fixtures and methods for interchangeable manufacture of motor cars, motor trucks, typewriters, adding machines, etc. The officers of the new company are: Albert A. Dowd, president; Donald A. Baker, vice president; Fred. E. Rogers, treasurer, and Thomas P. Orchard, secretary.

The J. T. Tractor Co., Cleveland, Ohio, manufacturer of the J. T. Tractor for agricultural and industrial purposes, has completed the first unit of its new factory at 1515 Fairfield Ave., Cleveland, Ohio. A 15,000-sq.ft. assembly plant and other buildings have been completed and a 58,000-sq.ft. machine shop is under construction. The officers of the company are: Fred R. Fuller, president; J. J. Tracy, vice president and chief engineer; C. E. Grove, secretary and sales manager; E. W. Stevens, treasurer; A. B. Saborsky, production manager.

Personals

ROBERT G. PILKINGTON, Chicago, Ill., has been appointed experimental engineer for the Wahl Co., Chicago, Ill.

H. G. STEPHENS has resigned as Eastern manager of the Republic Creosoting Company and has accepted a position with the Alignum Company.

A. S. WINTER, formerly advertising and sales manager for the Wm. Powell Co., has resigned to accept a position with the sales force of the Fairbanks Co., Pittsburgh, Pa., and will represent this company in southern Ohio.

RICHARD J. JACKER has resigned as designing engineer for the Stewart Warner Speedometer Corporation, Chicago, and will associate himself with the American Coke and Chemical Co., as designing mechanical engineer.

JOHN A. RATHBONE, formerly connected with the Wasson Piston Ring Co., Plainfield, N. J., and inventor of the Rathbone multiple molding process is now associated with the H. M. Lane Co., industrial engineers, Detroit, Mich. Mr. Rathbone will assist in general foundry layout work and foundry equipment arrangement.

JOHN CLYDE OSWALD, president of the Oswald Publishing Company and publisher of the *American Printer*, is also associated with the Preston Trading Co., 33 West 42d St., New York City, as vice-president. Mr. Oswald has also been elected president of the National Paper Trades Exchange, a subsidiary company publishing *Paper and Ink*.

A. A. ROELOFS, formerly special representative of the Precision and Thread Grinder Manufacturing Company in the Ohio territory, has been advanced to the position of manager of the Chicago office. The Precision and Thread Grinder Manufacturing Company, Philadelphia, Pa., manufactures of the multi-graduated precision grinding machines.

N. ROCKWELL, formerly Detroit representative of the Republic Creosoting Co., Indianapolis, Ind., has been promoted to the position of Eastern manager of this company and will be located at the Philadelphia office. E. J. Day, of Buffalo, has been placed in charge of the Detroit office and E. E. Bolte has been appointed manager of the Chicago office.

A. R. PETTERSON, formerly with the engineering department of the Osgood Bradley Car Co. of Worcester, Mass., is now acting chief engineer and director of production for the Allen Spindle Corporation, Boston, Mass. Previous to his connection with the Bradley Car Co., Mr. Petterson was president and general manager of the Petterson Engineering and Manufacturing Co., designers and builders of special machinery, tools and jigs.

B. G. KOETHER, after eighteen years of service with the Hyatt Roller Bearing Co., has been promoted to the vice presidency of the organization and will leave Detroit in a short time for Harrison, N. J., where he will have his headquarters, as head of the entire sales and advertising departments of the company. Mr. Koether was assistant sales manager of the company at Harrison, N. J., when he was promoted to sales manager ten years ago and came to Detroit to take up his new duties.

E. I. CHAPIN, for the last few years assistant factory manager for the Brown-Lipe Chapin Company's plant in Syracuse, N. Y., has resigned his position to take active charge of the Chapin & Baker Manufacturing Co., Syracuse, of which he is now manager. Previous to his connection with the Brown-Lipe Chapin Co., Mr. Chapin was with the H. H. Franklin Manufacturing Co., Syracuse. The Chapin & Baker Manufacturing Co., which was organized by Mr. Chapin and his associates some months ago, is manufacturing a line of special tools, including reamers, counterbores, toolholders, etc., and is engaged in jigs, fixture, and general contract work.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Taper Turning Tool, "Cruban."

Fairbanks Co., Distributors, New York City.

"American Machinist," Jan. 15, 1920.

The tool is designed for use with a hand screw machine, automatic screw machine, or lathe, and is fitted with a straight shank or taper shank as required. It will automatically cut any taper from $\frac{1}{16}$ in. per foot to $\frac{3}{4}$ in. per foot and any length up to 6 in. and it can be furnished to meet greater capacities if desired. The tool is entirely self-contained and is not affected by lost motion in the turret or tailstock.

Pointing Machine, "Namco" Bar.

National Acme Co., Cleveland, Ohio.

"American Machinist," Jan. 15, 1920.

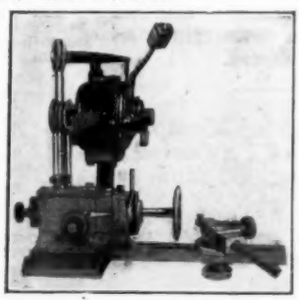
The machine is used to point the ends of bar stock preparatory for screw-machine operations. Being portable, it can be easily removed from place to place where the stock is stored. The revolving cutter head carries a plain cutter that is easily removable for sharpening. A flanged base is provided to prevent the chips from dropping on the floor. When preparing large amounts of stock, two machines operating end to end may be used to advantage; in such a case it would be unnecessary to reverse the bar. The machine is driven by a 1-hp. motor that is complete with switch and all necessary connections. The dimensions of the machine are: length, 4 ft.; width, 2 ft.; height, 4 ft., including motor.

Grinding Attachment, Multi-Graduated Precision.

Precision and Thread Grinder Manufacturing Co., 1932 Arch St., Philadelphia, Pa.

"American Machinist," Jan. 15, 1920.

The wheels are beveled so that they grind on opposite sides of the thread angle. On production work where a large number of duplicate pieces are to be ground, the wheels are set to the thread of the first part. The threads on the following pieces are set to the wheels, provision being made for this by an adjustable dog. After the wheels are once set redressing them does not change their alignment in relation to the thread. A graduated scale is provided for setting the wheel center to the same height as the work center. It is claimed that using two of these machines on thread grinding will result in increased production. In addition to thread grinding a variety of plain grinding, both internal and external, may be done on this machine.



Belt Shifter, Mechanical.

Kremer-Cummins Machine Co., 133 East 55th St., Cleveland, Ohio.

"American Machinist," Jan. 15, 1920.

Designed for use in connection with cone pulleys and operated by means of two handles. Is attached overhead near the cone pulley but is supported by independent brackets that are adjustable to suit conditions. A single piece of channel iron of suitable strength is used to support a sliding carriage that is moved by means of a rack-and-pinion arrangement. The rack is formed by cutting teeth in one leg of the channel, the pinion being attached to the end of a $\frac{1}{2}$-in. shifting rod that can be turned by means of a handle at the lower end. Attached to the carriage is a loop that surrounds the belt. Hence, as the carriage is moved along the channel, the belt is carried with it. A separate shifting rod, made of $\frac{3}{4}$-in. pipe, is used for the belt at the lower pulley.

Steadyrest, Lathe.

Advance Machinery Co., Lower Mosley St., Manchester, England.

"American Machinist" (English Edition), Dec. 27, 1919.

The chief improvement is in the form of the hinge. The cap, instead of being pivoted to the base by projecting lugs, swings on a pin through the medium of an eye-bolt uniform with the front clamping bolt. To enable the cap to be swung over, the rear upper corner of the base is rounded. The cap can be firmly tightened down at the rear as well as at the front, by a simple tightening of the front bolt. After the locknut on the rear bolt is once adjusted by firmly tightening-down the cap with it, no further adjustment is needed until wear takes place. A second improvement consists in the central arrangement of the steady-bars and their nuts. The stresses from the work are resisted directly in the line of force, not by screws disposed at the sides of the bars as is a common construction.

Bender, Hydraulic Plate.

Rice & Co., Ltd., Leeds, England.

"American Machinist" (English Edition), Jan. 3, 1920.

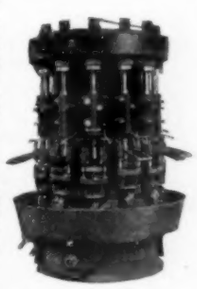
For bending boiler shell plates up to 15 ft. wide by 2 in. thick. The ram cannot be connected direct to the moving beam, owing to unequal thrust, which would occur when a narrow plate was being bent. To give a parallel movement to the moving beam the makers have adopted the lever principle. They claim small fractional loss in the machine, practically the whole power of ram being exerted on plate; power exerted is constant through whole stroke of the beam. Two methods are provided for feeding plates through the dies; one by gripping rollers on the left, the other by revolving drum and wire rope—both actuated by small hydraulic cylinder. Rate of feed is set by a slotted plate connected to cylinder. Feeding is automatic. Stroke of main ram controlled by tappet rod acting on the working valve. Machine is built entirely of steel; has overall length of 22 ft. by 5 ft., is 20 ft. in height.

Drilling and Boring Machine, Continuous.

Foote-Burt Co., Cleveland, Ohio.

"American Machinist," Jan. 22, 1920.

The machine is single-purpose, twelve-spindle and attended by a single operator. The spindles have a vertical adjustment of 8 in., making it possible to take care of the wear on the tools and also to raise the spindle for removal of the tool. Power is furnished to the machine by belt drive to a three-step cone pulley. The spindle head is rotated by a drive from the main shaft through a set of change gears which have further reduction through a worm gear, and this drives a pinion running in an internal gear in the base of the rotating-spindle body. The change gears are provided so that the speed of rotation can be altered if required by the character of the work or the material. The total height of this machine is 8 ft. 6 in. and the diametrical distance from center to center of the work spindles is 48 in., while their chordal center to center distance is $12\frac{1}{2}$ in.



Turning and Facing Machine, Continuous.

Foote-Burt Co., Cleveland, Ohio.

"American Machinist," Jan. 22, 1920.

The machine is single-purpose, has twelve spindles and is attended by a single operator. The machine as set up in the illustration runs with a spindle speed of 75 r.p.m. and has a tool feed of 0.00975 in. per revolution. The spindle speed is judged proper for this particular piece of work and is geared down from a pulley speed of 300 r.p.m. At this speed and feed the total time per cycle of the machine is 3.6 min., or 16.6 revolutions of the spindle head per hour. This gives a rate of machine production equal to 132 completed pieces per hour.

Clip, paste on 3 x 5-in. cards and file as desired

Obituary

MISS KATHRYNE M. HAUN, treasurer of E. F. Houghton & Co., Philadelphia, Pa., engaged in the manufacture of industrial oils and leather goods, died Feb. 9 at her home, 1332 Wagner Ave., Philadelphia, after a short illness from pneumonia. Miss Haun entered the employ of Houghton & Co. to do minor clerical work and when the company was incorporated in 1910 she was appointed treasurer of the company because of her grasp of the company's financial affairs.

HENRY B. BARTLETT, of Bogota, N. J., died Jan. 18, 1920, from pneumonia. Mr. Bartlett was born 1856 in Carbondale, Pa. He began his mechanical experience in 1872 at the old locomotive works in Paterson, N. J., and completed his trade at the Faerel Foundry and Machine Co., Waterbury, Conn. Since that time he has been connected with the Dietrich & Harvey Co., Baltimore, in the manufacture of its open-side planing machines; the Bullard Machine Co., Bridgeport, Conn.; and later with the small-tool department of Pratt & Whitney. In 1896 he went to Berlin, Germany, as general manager of the Ludwig Loewe Co., a large manufacturer of shop tools and machines. Mr. Bartlett returned to America in 1902 and became teacher of tool and machine making at the Hebrew Technical Institute of New York. This position he held for eleven years. At the time of his death Mr. Bartlett was consulting engineer for B. T. Perkins & Sons and their allied paper interests at Holyoke, Mass.

E. FRED. WOOD, formerly vice president of the International Nickel Company, died suddenly on Jan. 5, 1920, in the sixty-second year of his age. Mr. Wood was born in Milwaukee on Aug. 28, 1858. After leaving college he devoted himself assiduously to the study of metallurgy. He entered the employ of the Carnegie Steel Company and rapidly rose to the position of assistant general superintendent of the Homestead plant, which position he filled for a number of years. Upon the organization of the International Nickel Company he became first vice president and a member of the board of directors and of its executive committee. When the United States entered the World War, Mr. Wood resigned his official connection with the International Nickel Company to devote himself to public work, and became a member of the Committee on Production of the War Industries Board, of which committee Samuel Vauclain, president of the Baltimore Locomotive Works, was chairman. Mr. Wood served continuously on this board during the entire period of the war, without compensation. He was a member of the University of Michigan Club, the Automobile Club, the New York Athletic Club, the Society for Electro-Chemical Engineers and of the Railroad Club.

Construction Metallique Representative Returns to Belgium for Two Months

Lieutenant Marc Jeanjean, who has been in Washington for the past six months representing the Societe le Construction Metallique of Brussels, Belgium, in the purchase of large quantities of machine tools from the Government, has left for Belgium.

Lieutenant Jeanjean, according to present plans, will return to this country within two months, and it is expected that he will bring with him additional orders for machine tools and shop equipment.

On his return trip, Lieutenant Jeanjean anticipates making large purchases of machine tools and shop equipment on the open market. The material purchased from the War Department has been entirely satisfactory, but a number of the machine tools desired by the Construction Metallique are not obtainable from among the surplus supply of the War Department.

Foundry and Machine Company Purchases Part of Explosive Plant at Nitro, W. Va.

The Central Foundry and Supply Company, of Columbus, Ohio, with which the Cummings Machine Company, of Minster, Ohio, is consolidated, has just completed negotiations for the purchase from the Charleston Industrial Corporation of five of the large buildings at Nitro, W. Va. These buildings were built and occupied during the war by the United States Government for the manufacture of war equipment.

With the purchase of the five large buildings at Nitro, the Ohio concern acquired 5½ acres of land and a number of smaller buildings. This sale represents the first purchase by an individual concern of any of the industrial buildings at Nitro.

The War Department during the early part of December, 1919, consummated a sale to the Charleston Industrial Corporation of the explosive plants and other facilities owned by the Government at Nitro. The transaction involved an exchange of $8,551,000. Under the terms of the contract, the Charleston Industrial Corporation was not permitted to resell any part of the facilities at Nitro without the approval of the War Department.

The sale to the Central Foundry and Supply Company was approved by the Ordnance Salvage Board at Washington.

The buildings purchased comprise a sheet-metal shop, a brass and iron foundry, a pipe and electric shop, welding shops and a number of small buildings.

It is understood that the intention of the Central Foundry and Supply Company is to establish a branch plant at Nitro, and remodeling of the buildings and the installation of new machinery and equipment are expected to take place immediately.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A firm of engineers in France desires to secure an agency from manufacturers for the sale of factory equipment and machine tools. Correspondence should be in French. Reference. No. 31,633.

Catalogs and estimates are desired by a firm in Cuba for the purchase of 28 kilos of 10-in. and 12-in. cast-iron pipe, universal joints; two steel water tanks, each of 1,000,000 gal. capacity; and rock crushing machinery, capacity about 40 m. daily, with gasoline, crude oil, or steam motive power. Quotations should be given f.o.b. New York. Reference. No. 31,630.

A merchant firm in Ireland desires to purchase general tool supplies, drilling and grinding machinery. Quotations should be given c.i.f. port in Ireland. Payment, cash against documents. Reference. No. 31,813.

A merchant in South Africa desires to purchase general picture-frame-making machinery. Terms, cash. Reference. No. 31,935.

A glass manufacturing concern in India desires to purchase glass-making machinery, for use with coal fuel, of a daily capacity of about five tons, for the manufacture of bottles, sheet glass, chimneys, soda-water bottles, tumblers, etc. Quotations should be given c.i.f. port of India. Payment, cash against documents, or if required, cash with order. References. No. 31,933.

A commercial agent in England desires to purchase direct for consumer, 18-in. cast-iron gas mains, spigot and socket type, in 12-ft. lengths. Full specifications, terms, etc., are required. Quotations should be given delivered on board steamer in English port. Reference. No. 31,929.

A fruit company in Honduras desires to purchase tractors for farm work. Quotations should be given f.o.b. New Orleans. Payment, cash. No. 31,930.

A merchant in France desires to purchase electric appliances. Quotations should be given c.i.f. French port. Payment, cash. Correspondence may be in English. Reference. No. 31,931.

A firm of manufacturers in Spain desires to secure the sole agency on commission for the sale of electrical machinery and supplies, electric flat irons, machinery belting. Correspondence should be in Spanish. References. No. 31,689.

A firm in Spain desires to purchase machine tools, pumps, ventilators, grease cups, tools, elevating machinery, and can-making machinery. Quotations should be given f.o.b. American port. Correspondence may be in English. References. No. 31,755.

A manufacturer in Austria desires to get in touch with manufacurers of machine tools of all kinds, leather belting, and machinery and supplies required by foundries. References. No. 31,751.

A firm specializing in American electrical manufactures in England desires to secure an agency or purchase electrical machinery and control gear, motor and generators, alternating and direct current. Will purchase if agency is unobtainable. Quotations should be given c.i.f. English port. Ref. No. 31,496.

A manufacturing company in India desires to purchase and secure an agency for abrasives, anvils, Babbitt metal, belt fasteners and tighteners, blocks (tackle), blowers, boiler compound and graphite, boiler-room supplies, cement, bolt and nut machinery, and machinery and tools of all kinds. Quotations should be given f.o.b. shipping port. Reference. No. 31,906.

A commercial agent in Morocco desires to secure the representation of the manufacturers and exporters for the sale of galvanized-iron products, hardware, enameled iron, zinc in sheets, building materials, tools, etc. Reference. No. 31,894.

A company in England desires to purchase for resale to clients heavy steel melting scrap, no limit to quantity; billets, blooms, slabs, and ingots for shipbuilding purposes. Quotations desired, c.i.f. Manchester, Liverpool, and Middlesbrough. Terms, payment against documents in England. Reference. No. 31,897.

(Continued on Page 430d)

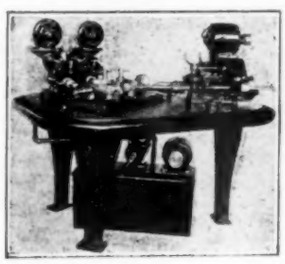
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Milling Machine, Two Spindle Spline.
Taylor & Fenn Co., Hartford, Conn.
"American Machinist," Jan. 22, 1920.

This machine is automatic in operation and will simultaneously machine two spline grooves on opposite sides of the same piece, single splines of the same or different dimensions, simultaneously on two pieces, or through slots such as drift-pin slots or cutter slots in boring bars and similar work. Splines of exact duplicate lengths and uniform finish and accuracy can be produced in a minimum period of time, the duration of which, of course, depends on the length, width and depth of the spline and the cutting resistance of the metal being worked. Specifications: Will spline work up to 5 in. in diameter and 6 in. long; longer work may be splined by resetting; spindle speeds, (6) from 302 to 1,885 r.p.m.; table feeds, 10.

Drilling Machine, Crankshaft Oil-Hole.
Edwin Harrington Son & Co., Inc., Philadelphia, Pa.
"American Machinist," Jan. 22, 1920.

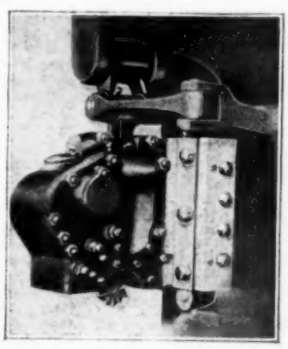


Specifications: Drilling capacity in steel, $\frac{7}{16}$-in. holes; distance between spindles, maximum 10$\frac{1}{2}$-in., minimum 7$\frac{3}{4}$-in.; spindle traverse 8-in.; height, spindles above table 49-in., table above floor, 31 in.; taper hole in spindles, Morse No. 2; spindle speeds, 1,000 r.p.m.; feeds per revolution of spindle, 0.002, 0.003, 0.004 and 0.005-in.; size of each motor $\frac{1}{2}$ hp.; speed of each motor 1,750 r.p.m.; floor space, 69 x 48 in.; weight, without motors 2,150 lb., with motors 2,415 lb.

Tipped Tools, Zubar.
Zubar Manufacturing Co., Inc., 5701 McMahon Ave., Philadelphia, Pa.

This line of tools includes all standard shapes and sizes and is furnished in special shapes to suit requirements. The design is intended to combine the advantages of a solid forged tool such as heat conductance, strength, etc., with the economical features of the built-up tool. The material in the shank allows the tool to "give" before it will break and the tip may be rehardened at any time in the usual way. The tools can be tipped with any make of high-speed steel desired by the customer and are furnished ground, ready for use.

Cherrying Attachment, Jackson Die-Sinking Machine.
Jackson Machine Tool Co., Jackson, Mich.
"American Machinist," Jan. 22, 1920.

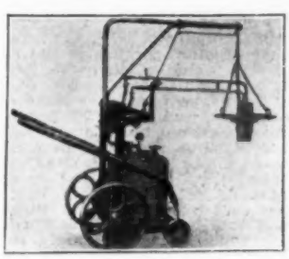


Is now being put on the No. 5 and No. 6 Jackson duplex typeless die-sinking machines. This redesign of the attachment has been adapted from a similar attachment which was first brought out for the No. 10 machine. The rotary oscillating motion is provided by means of a connecting-rod attached to the lug on the upper side of the toolholder. The tool housing has a small movement so timed that the cutter is lifted from the cut on its return stroke and again lowered on the cutting stroke. Ample bearing ways and take-up gibs insure it against wearing loose.

Wrench, Hopper Car Safety.
Safety Wrench and Appliance Co., 13th and Cherry Sts., Philadelphia, Pa.
"American Machinist," Jan. 22, 1920.

It is said to have automatic features that protect the workman at all times against injury, when opening the car; also that the car can be opened much quicker than by the usual method. The handle is offset, to permit free movement, and two pawls are provided for the ratchet, one of which is ready to act in case the door should stick. In operation the car dog is held up and the wrench lowered with a quick motion; the pawl will then automatically spring out, allowing the hopper door to drop. If the door does not start, the handle is raised and then pressed down, thus forcing the door open.

Drier, Bull Ladle.
Hauck Manufacturing Co., Brooklyn, N. Y.
"American Machinist," Jan. 22, 1920.

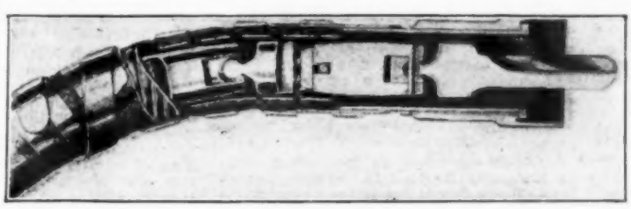


The burner operates with compressed air at a pressure from 20 to 100 lb., burns fuel oil, crude oil or kerosene, and lights instantly. The flame spreads evenly and quickly and is directed downward toward the bottom of the ladle. The drier heats the bottom and sides of the ladle white-hot, if required, and it is claimed to be a more efficient and less expensive method than the use of wood fires.

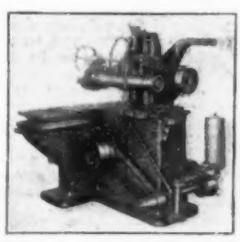
Flexible Shaft, "Strand" Link Type.
N. A. Strand & Co., 549 West Washington Boulevard, Chicago, Ill.
"American Machinist," Jan. 22, 1920.

It is said that in shafts of this type the wear on the joints is reduced to the minimum.

Specifications: Standard length, 7 ft.; links, 1 in. in diameter; diameter over casing, 1$\frac{1}{8}$ in.; maximum speed, 1,750 r.p.m.; power delivered, 2 hp. at 400 r.p.m.; will operate grinding wheels up to 10 x 1$\frac{1}{2}$ inches.



Grinding Machine, "Diamond" Surface.
Diamond Machine Co., Providence, R. I.
"American Machinist," Jan. 22, 1920.



Improved automatic surface-grinding machine. One improvement is in the elimination of one motor. In the older type of machine separate motors were used for the spindle and table drives while in the improved type but one motor of 3 hp. is used for both purposes. Power is transmitted to the spindle by chain and belt drive and to the table by chain drive through worm gearing and a belt. The second improvement is in the method of hanging the counterweight. By use of the overhanging arm shown in the illustration, the cable for the counterweight is kept free from contact with any part of the machine, thus preventing wear and assuring its free movement.

Clip, paste on 3 x 5-in. cards and file as desired

Merchants in Scotland desire to purchase acetylene lamps used by miners in coal pits, wire nails, and bar iron and sheets. Quotations should be given c.i.f. Glasgow or Leith. Payment, cash. Reference. No. 31,900.

A manufacturer in Japan desires to purchase machinery for renewing files. Full information regarding capacity of machinery, price lists, etc., are requested. Quotations should be given c.i.f. Japan. Terms, cash. Reference. No. 31,899.

A firm in Sweden doing an import business desires to secure an agency for the sale of cutlery and hardware. Reference. No. 31,843.

An engineer in Spain desires to secure agencies and purchase all kinds of machinery for electric, hydraulic, metallurgic, and chemical industries. Payment, cash against delivery of merchandise. Correspondence should be in Spanish, French or Italian. Reference. No. 31,847.

A rice miller in India desires to purchase one horizontal steam engine, 9-in. cylinder and 16-in. stroke; one vertical boiler of 10 hp., complete with fittings, and chimney, pressure 100 lb.; one tubular boiler, of 10 hp., complete with fittings and chimney, pressure 100 lb., above to be tested to 200 lb. hydraulic pressure, chimneys to be extra long to burn husk fuel; one duplex pump, 3 x 2 x 3 in.; and one screw-cutting gap bed lathe, 10 ft. long, with 3-ft. swing in gap, 9 in. centers (height), or nearest size. Quotations should be given c.i.f. Rangoon. Payment, cash in full with order. Reference. No. 31,857.

A company in England desires to purchase motors for use in the construction of electric vehicles, in quantities of from five to twenty per week, sizes, 4, 6, and 8 hp., and voltage for either sizes of 88 for lead batteries, and 60 for Edison batteries. The motors should be in every way suitable for traction purposes, and be capable of giving three times the normal torque at one-half speed for 10 min. and have the highest possible efficiency from half load to 200 per cent overload, fitted with ball bearings and totally inclosed. Quotations should be given c.i.f. English port. Reference. No. 31,859.

A firm in France desires to secure the agency for machinery and tools, farm implements, etc. Correspondence may be in English. Reference. No. 31,877.

A merchant in Paraguay desires to purchase or secure an agency for all sorts of construction materials, such as steel beams, girders, galvanized zinc, wire, cement, firebricks, forge coal and coke, and roofing materials. Quotations should be given f.o.b. New York. Terms, cash against documents. References. No. 31,878.

The engineer of a cotton mill in India desires to purchase a fully equipped spinning mill of 22,000 ring spindles to spin yarns from 12⅛s to 16⅛s, and 16s to 24s; equipment to include steam or oil engine; also fire-extinguishing sprinkler installation and building material, such as cast-iron pillars, H steel beams, angles and tees, expanded metal, etc.; also shafting and gearing. Quotations should be given either c.i.f. Rangoon, or f.o.b. American port. Quotations and specifications must be as detailed as possible. Reference. No. 31,846.

The financial agent of an importing company in Bulgaria desires to receive immediate quotations direct from manufacturers or exporters on 50 metric tons of sheet iron up to 1½ mm. thick; 200 tons of wire; thirty to forty small steam plows of 5 to 6 hp., two without wheels; thirty complete thrashing machines, with 5 tons of belting; 1,000 to 2,000 sewing machines. Reference. No. 31,831.

A manufacturer in France desires to secure an agency for the sale of all kinds of machinery, such as steam engines, pumps, and machinery used in sugar plants. Correspondence may be in English. Reference. No. 31,828.

A firm in Brazil desires to secure the agency for steel manufacturers. Correspondence may be in English. Reference. No. 31,829.

A manufacturer's agent in Australia desires to secure an agency for the sale of hardware and automobile accessories. Reference. No. 31,826.

An importer in Belgium desires to secure an agency on commission or consignment for the sale of ore and cast iron of good quality for high furnace and steel manufactory, zinc ore, lead, and black lead, graphite and crucibles for foundries, aluminum, both in bars and worked, tin, and antimony. Correspondence should be in French. References. No. 31,833.

An importing company in Korea desires to receive catalogs in duplicate, together with terms of export, and all information, such as prices, both with and without bodies, particulars of construction, and terms, for the sale of automobiles in Korea and Manchuria. Reference. No. 31,854.

Trade Catalogs

Micrometers. Reed Small Tool Works, Worcester, Mass. Catalog No. 4, pp. 40, 7½ x 4¼ in. This bulletin contains forty pages and twenty halftones describing and illustrating the Reed micrometers; also its list prices. Several tables of the metric system and decimal equivalents of millimeters and fractions of millimeters are given in this bulletin.

Furnace Burners. Hauck Manufacturing Co., 101-113 Eleventh St., Brooklyn, N. Y. Bulletin No. 119, pp 16, 9 x 6 in. This bulletin illustrates and describes in detail the different types of oil burners manufactured by this firm. The book also has several illustrations showing the application of the Hauck burners to various types of furnaces.

Grinders. Columbia Manufacturing Co., Belleville, Ill. Catalog No. 26, pp. 21, 6 x 3½ in. A catalog covering grinding machines, buffers, countershafts and presses for heavy hardware, mill supply and auto trade. A copy of this catalog will be sent upon request.

Sandblast Pamphlet. Pangborn Corporation, Hagerstown, Md. This pamphlet, the title of which is "To See Is to Understand," gives an illustration of the Pangborn Corporation and also illustrations of its staff of engineers, the various officers, the egineering departments, the manufacturing departments both interior and exterior, and equipment manufactured by this company.

Helical Gear. The Fellows Gear Shaper Co., Springfield, Vt. Catalog, pp. 48, 6 x 9 in. This is a treatise covering the application of helical or twisted teeth to gears operating on parallel axes, together with data on design, application and production.

Pyrometer. The Brown Instrument Co., Philadelphia, Pa. Catalog No. 12, pp. 88, 8 x 10½ in. The first few pages of this catalog contain some illustrations of the shop, testing room, inspecting room and laboratory where the Brown pyrometers are manufactured. Other pages show the construction of the pyrometer and its uses. Charts showing how temperature records are made and tables are given of the melting points of chemical elements. The new catalog is printed in two colors on heavy coated stock and each page presents illustrations and a description of pyrometers for practically every use for measuring temperatures, gaging and time recording.

Valves. Nelson Valve Co., Philadelphia, Pa. Catalog and price list, pp. 156, 5½ x 7¾ in. This is a cloth-bound catalog and contains many illustrations of bronze, iron and steel valves; gate, globe, check and non-return valves. Besides a brief description of each valve there is also a table giving the sizes, numbers, height, diameter, prices, etc.

Condensing Apparatus. Worthington Pump and Machinery Corporation, 115 Broadway, New York. Catalog No. W. 701, pp. 115, 6 x 9 in. This catalog contains many halftone illustrations of the company's condensers in various machine shops and also some information on condensation. There are also tables on low-pressure steam and two charts showing the friction in surface condenser tubes.

Machinists Tools. Union Tool Co., Orange, Mass. Catalog, pp. 61, 7 x 5 in. This catalog gives the sizes and prices of the products manufactured by this company, such as calipers, dividers, tap wrenches, nail sets, rules, squares, hacksaw frames and toolholders for various machines.

Elevators and Conveyors, Electric Hoist and Overhead Cranes. Link Belt Co., Chicago, Ill. Book No. 380. Book No. 375 contains 108 pages, and each page gives halftone illustrations showing elevators and conveyors in use for a great many purposes. Book No. 380 illustrates and describes the electric hoist and cranes. It contains 100 pages and describes and illustrates the construction of the hoist and the conveyor, and shows their use in different manufacturing plants.

Special Tools for Ford Repair Shops. K. R. Wilson, 10-16 Lock St., Buffalo, N. Y. Catalog, pp. 29, 6 x 3½ in. An illustrated and descriptive catalog of his tools for repairing Ford automobiles, also the list prices.

Whiting Converter. Whiting Foundry Equipment Co., Harvey, Ill. Catalog No. 150, pp. 131, 9 x 6 in. This catalog gives a complete description of the Whiting side-blow converter for making small steel castings; also its relations to other processes. Several illustrations are given of the Whiting converter in operation in various machine plants.

Theory and Practice. Issued by the Federal Board for Vocational Education, Washington, D. C. Bulletin No. 52 (Advance Issue), 6 x 9 in., 128 pages. This bulletin gives outlines of instruction in related subjects for the machinist's trade, including general trade subjects for certain other occupations. It is divided into four parts: I Introduction. II Analysis of the machinist's trade and of related general trade subjects. III Suggestions on the organization of material and methods of instruction. IV A suggestive part-time four-year apprentice program.

Screw Jacks. The Duff Manufacturing Co., Pittsburgh, Pa. Bulletin No. 300, 9 x 6 in. A descriptive circular of its new type high-speed ball-bearing jack.

Safety Code. Norton Co., Worcester, Mass. Booklet, pp. 20, 6 x 9 in. This is the third revised edition of this booklet for the use, care and protection of abrasive wheels.

Forthcoming Meetings

The American Institute of Mining and Metallurgical Engineers will hold its annual meeting in New York City, Feb. 16 to 19 inclusive.

The American Society for Testing Materials will hold its next annual meeting during the week of June 21, 1920, at the New Monterey Hotel, Asbury Park, N. J. This society has its headquarters in the Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa. C. L. Warwick is the secretary and treasurer.

The American Welding Society will hold its annual meeting at the Engineering Societies Building, 33 West 39th St., New York City, on Apr. 22, 1920, at 10:30 a.m. Howard C. Forbes is the secretary.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of Eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

The Material Handling Machinery Manufacturers' Association will hold its meeting in New York City on Feb. 26 and 27.

The National Motor Boat, Ship and Engine Show will be held in New York City on Feb. 20 to 28.

The National Association of Engine and Boat Manufacturers, Inc., will hold its meeting in New York City on Feb. 26.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Pa., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Second Annual Aëronautical Exposition of the Manufacturers Aircraft Association, Inc., will be held at the Seventy-first Regiment Armory, 34th St. and Park Ave., New York, on Mar. 6-13, 1920. S. S. Bradley, 401 Fifth Ave., New York City, is the general manager.

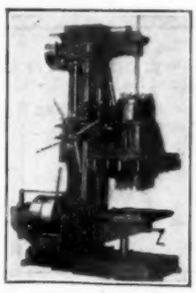
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drilling Machine, Multiple Spindle

Fox Machine Co., 1804 West Ganson St., Jackson, Mich.

"American Machinist," Jan. 29, 1920



Specifications: Head travel, 24 in.; drilling area, 12 x 18 in. rectangular, or 16 in. round; center of head to face of column, 14 in.; work surface of table, 18 x 24 in.; table to base, maximum 29 in., minimum 10 in.; height to top of frame, 99 in.; height to top of drive shaft, 120 in.; maximum number of spindles, 1 speed 24, 2 speeds 16; pulley, 16 x 5¼ in.; speed, 450 r.p.m.; hp., 5; floor space, 46 x 75 in.; weight, net 5,000 lb., crated 5,500 lb.; will drill eight ¾-in. or twenty-four ½-in. holes at speed of 70 ft. per minute and feed of 0.0045 in. per revolution in cast iron.

Grinding Machine, Improved Spindle

Badger Tool Co., Beloit, Wis.

"American Machinist," Jan. 29, 1920

This type of construction uses one radial bearing in each housing, with an additional double row of ball-thrust bearings in the left-hand housing. To obtain a more perfect mounting the bearings are fitted into individual housings which are detachable from main body of machine. The ends of the spindles are turned and ground to an accurate taper; wheel collars are drawn up on the taper by a locking nut. Solid renewable felt rings are placed in all end caps and held by removable end plates. A special grease filler cap is provided to prevent dirt and grit from entering the bearings.

Furnace, Kerosene, All In One

Champion Kerosene Burner Co., Kenton, Ohio.

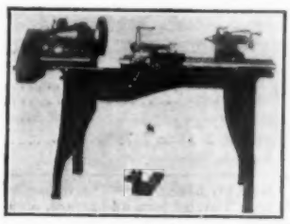
"American Machinist," Jan. 29, 1920

Designed to meet the requirements of the structural steel fabricators; is suitable for outside work as well as inside. Recommended for heat-treating and general forge work. Heat is generated by a kerosene burner that is said to produce a temperature of 2,500 to 3,000 deg. F. in five minutes' time. The nature of the flame is such that there is a minimum of oxidation smoke and odor. Several types are made to suit various conditions under which they are to be used. For close quarters inside, a small model with a cylindrical firebox is furnished.

Lathes, Star Gap

Seneca Falls Manufacturing Co., Seneca Falls, N. Y.

"American Machinist," Jan. 29, 1920

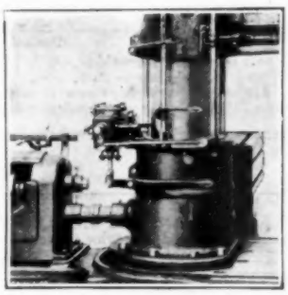


Made in two sizes, one with an 11 and 18 in. swing and the other with a 13 and 21 in. swing. The beds are of the box-section type, very heavy through the gap sections. Bridge pieces are furnished to close up the gaps when not needed. Beds are made 5, 6, 7, 8 and 10 ft. long. All standard threads, from 3 to 72, can be cut, including 11½ and 27 pipe threads. Can be equipped with transposing gears or metric pitch lead screws. Extra attachments that can be furnished include raising blocks, quick-change gears, taper attachment, motor drive, draw-in chuck, milling and gear-cutting attachment, etc. Weights: 11 and 18 in. swing gap lathe with 6-ft. bed, 880 lb.; 13 and 21 in., with 6-ft. bed, 1,390 pounds.

Clamping Device, for Radial Drilling Machines.

Fosdick Machine Tool Co., Cincinnati, Ohio.

"American Machinist," Jan. 29, 1920.



A combination clamping device operates by compressed air or by hand. Is attached near the base of the column and is intended for low pressure, the relief valves being set for 45 lb.; is said to operate without shock or jar at 150 lb. or more owing to the air cushion at each end of cylinder. Valve is flat disk type; has six ports; is controlled mechanically by horizontal shifting rod that extends the full length of the radial arm. If supply of compressed air should fail clamp may be operated by hand.

Drilling Machine, All-Geared 26 in. Gang.

Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill.

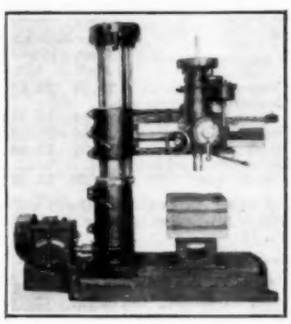
"American Machinist," Jan. 29, 1920.

Specifications: Capacity, 2 in. hole; distance, center to center of spindles, 24 in.; face of column to center of table, 12 in.; diameter of spindles, 1⅞ in.; hole in spindle, No. 4 Morse taper; distance, spindle to table, maximum, 40 in.; spindle to base, maximum 53½ in., minimum 18½ in.; vertical travel, spindle 14 in.; head, 23 in.; table, 20 in.; square table, 18 x 18 in.; round table, 23 in. in diameter; speeds, eight, 23 to 230 r.p.m.; feeds, eight, 0.005 to 0.075 in. per rev.; all speeds and feeds independent of each other; floor space, 49 x 70 in.; speed of tight and loose pulleys, 325 r.p.m.; weight, net, 6,330 lb.; crated, 6,670 lb.

Drilling Machine, Radial.

Morris Machine Tool Co., Court and Harriet Sts., Cincinnati, Ohio.

"American Machinist," Jan. 29, 1920.



Specifications: Distance spindle to base (maximum, 52⅜ in.; minimum, 16½ in.); maximum distance spindle to table, 31⅜ in.; spindle traverse, 12 in.; taper hole in spindle, Morse No. 4; spindle speeds (cone drive, 20 to 400; speed-box drive, 18 to 400); work surface of table, 18 x 18 in.; work surface of base (with 2½-ft. arm, 30 x 35 in.; with 3-ft. arm, 30 x 41 in.; with 3½-ft. arm, 30 x 47 in.); weight, crated (with 2½-ft. arm, 4,000 lb.; with 3-ft. arm, 4,425 lb.; with 3½-ft. arm, 5,165 lb.)

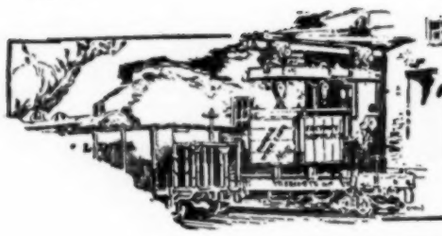
Grinding Machine, Cylinder Link.

Churchhill Machine Tool Co., Manchester, England.

"American Machinist" (English Edition), Jan. 10, 1920.

Is fitted with a radius link and surface grinding attachment, capable of dealing with a radius as small as 12 in., and a maximum of 48 in. Spindle is double-eccentric type, giving a planetary motion. Column is mounted on horizontal slide having automatic longitudinal motion along bed, controlled by adjustable reversing dogs for varying stroke to suit the length of hole being ground. This slide provided with four changes of speed; is arranged for all kinds of cylinders and holes. Grinding-wheel spindles are easily detachable. Table has cross adjustment of 24 in.; crossfeed screw for table has indexed dial reading in thousandths of an inch. Table is fitted with automatic cross traverse. Vertical feed is by handwheel for elevating the spindle head. Cross traverse self-acting and fitted with adjustable dogs for any length of traverse up to maximum. Links may be ground on radial portion and on the flat surface; also all kinds of connecting rods and links may have holes ground in them.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Month Ago
No. 2 Southern	$44.60	$39.10
Northern Basic	42.80	38.20
Southern Ohio No. 2	43.80	40.80
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	47.65	45.65
Southern No. 2 (Silicon 2.25 to 2.75)	47.70	43.20
BIRMINGHAM		
No. 2 Foundry	41.00	35.50
PHILADELPHIA		
Eastern Pa. No. 2, No. 2x, 2.25-2.75 sil.	45.35-45.65*	42.50*
Virginia No. 2	43.25*	40.00*
Basic	43.00†	40.00†
Grey Forge	42.50*	39.50*
CHICAGO		
No. 2 Foundry local	43.25	40.00
No. 2 Foundry, Southern	46.60	40.50
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	43.65	39.40
Basic	42.93	36.40
Bessemer	43.40	37.40
MONTREAL		
Silicon 2.25 to 2.75%	43.25	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.07	$3.62-4.62	$3.97	$3.47	$4.07
Soft steel bars	3.52	3.52	3.97	3.52	4.07	3.52	3.97
Soft steel bar shapes	3.52	3.52	3.97	3.57-3.82	4.07	3.52	3.97
Soft steel bands	4.22	4.22	4.57	5.25	.....	.....	.....
Plates, ¼ to 1 in. thick	3.67	3.67	4.27	5.00	4.47	3.67	4.27

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.00	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	3.90
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-4.00	5.32-7.00	5.17	5.35	5.27
No. 12	3.60	5.37-7.10	5.22	5.40	5.32
No. 14	3.65-4.10	5.42	5.27	5.45	5.37
No. 16	3.75-4.20	5.52	5.37	5.55	5.47
Black					
Nos. 18 and 20	4.15-4.65	6.80-7.30	6.02	5.95	6.30
Nos. 22 and 24	4.20-4.70	6.85-7.35	6.07	6.00	6.35
No. 26	4.25-4.75	6.90-7.90	6.12	6.05	6.40
No. 28	4.35-4.85	7.00-8.00	6.22	6.15	6.50
Galvanized					
No. 10	4.70	6.90	8.22	5.05	6.65
No. 12	4.80	6.95	8.27	5.10	6.70
No. 14	4.80	7.10	8.42	5.25	6.85
Nos. 18 and 20	5.10	7.40	8.72	5.55	7.15
Nos. 22 and 24	5.25-5.75	7.80	7.12	6.95	7.55
No. 26	5.40-5.90	7.95	7.27	7.40	7.70
No. 28	5.70-6.20	8.25-9.00	7.57	7.50	8.00

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.40	$6.00
Flats, square and hexagons, per 100 lb. base	6.00	5.90	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00-26.00	$25.50-30.00
Cleveland	20.00	20.00
Chicago	16.50	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
1, 11/16, 5/8, 9/16, 1/2, 7/16, No. 8, 3/8 and No. 10, 1/4, No. 12, 5/16, No. 14 and 9/32, No. 18, No. 20	21.00 to 30.00	3/16 by 12 in. long	14.00
		1/4 by 19 in. long	12.00
		5/16 by 19 in. long	10.00
		3/8 by 21 in. long	10.00
		Special Welding Wire, Coated	
		1/4	33.00
		5/16	30.00
		3/8	38.00

Domestic 20c. for 1/16, 15c. for 1/8 to 1/16

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	5.50	4.32
Cold-rolled strip steel	10.00	8.25	8.00
Floor plates	6.55	6.00	6.27

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
1/8, 1/4 and 3/8	50½%	24%	1/8 to 1/4	30%	23½%
1/2	54½%	40%			
1/2 to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	46½%	29%	1/8 to 1/4	30½%	24½%
1/2	51½%	39%			
1/2 to 1½	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	36½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
¼ to 3 in. steel butt welded	40%	24%	40%	31%	57½%	44%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	53½%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 22½%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.25	19.50	18.50
Tin in 5-ton lots	60.00	62.75	72.50
Lead	9.00	8.75	5.00
Spelter	9.50	9.55	6.60
ST. LOUIS			
Lead	8.375	8.375	4.65
Spelter	9.225	9.225	6.25

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

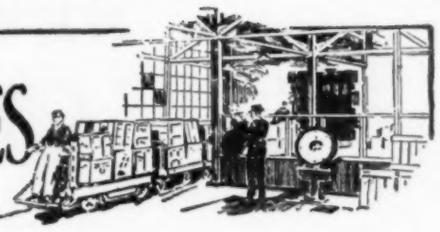
	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago Current	Chicago Year Ago
Copper sheets, base	29.50	29.00	29.00	31@32	30.00	36.00	32.00
Copper wire (carload lots)	29.25	28.25	28.00	29.50	32.00	27.00	28.50
Brass sheets	26.50	25.50	29.00	29.00	32.00	27.00	29.00
Brass pipe	32.00	32.00	37.00	34.00	38.00	35.00	37.00
Solder (half and half) (case lots)	39.00	35.00	41.00	40.50	44.00	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	22.76
New York	23.75	26.28
Cleveland	29.00	30.00
Chicago	26.00	28.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill..... 12.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	18.75	15.50	18.40
New York	14.00	15.00	14.50	15.50
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	11.25	7.50
Chicago	12.50	8.50
Cleveland	11.75	10.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy, and crucible	16.50–17.00	16.00	18.00	17.00	17.00
Copper, heavy, and wire	16.00 16.50	15.00	17.50	16.00	16.25
Copper, light, and bottoms	15.00 15.50	12.50	16.00	13.00	15.00
Lead, heavy	6.75 7.00	4.00	7.50	4.00	7.50
Lead, tea	6.00 6.25	3.00	5.00	3.00	6.00
Brass, heavy	11.50 12.00	9.50	14.00	12.00	16.25
Brass, light	9.00 9.50	7.50	10.50	8.00	10.00
No. 1 yellow brass turnings	9.50 10.00	9.50	11.00	8.00	11.00
Zinc	6.00 6.25	5.00	5.00	4.00	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	28.00
Chicago	29.00	38.00
Cleveland	32.00	33.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	70.00	80.00	70.00	75.00
Commercial	50.00	42.00	20.00	21.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+2.00	.80	$1.00	$1.25	$1.25	.98
Hot pressed hexagon	+ 2.00	.80	1.00	1.05	1.25	.78
Cold punched hexagon	+ 2.00	2.50	1.00	.75	.90	1.00
Cold punched square	+ 2.00	2.50	1.00	.75	.90	1.00

Semi-finished nuts, ⅞ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	60%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	25%	50%	35–5%
Larger and longer up to 1¼ in. by 30 in.	15%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.50 Cleveland..... $4.50 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	15%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	5%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	List	30%	List
Chicago	10%	List	10%	List plus 20%
New York	10%	25% from list	10%	List

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	30%	55% off	45%
Tinned	30%	55% off	45%

Boiler, ½, ¾, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$6.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72

Structural, same sizes:

New York...$6.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ⅛-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.625	4.25
Chicago	5.00	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Feb. 12	Feb. 5	Jan. 29	Jan. 22
Prompt furnace	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

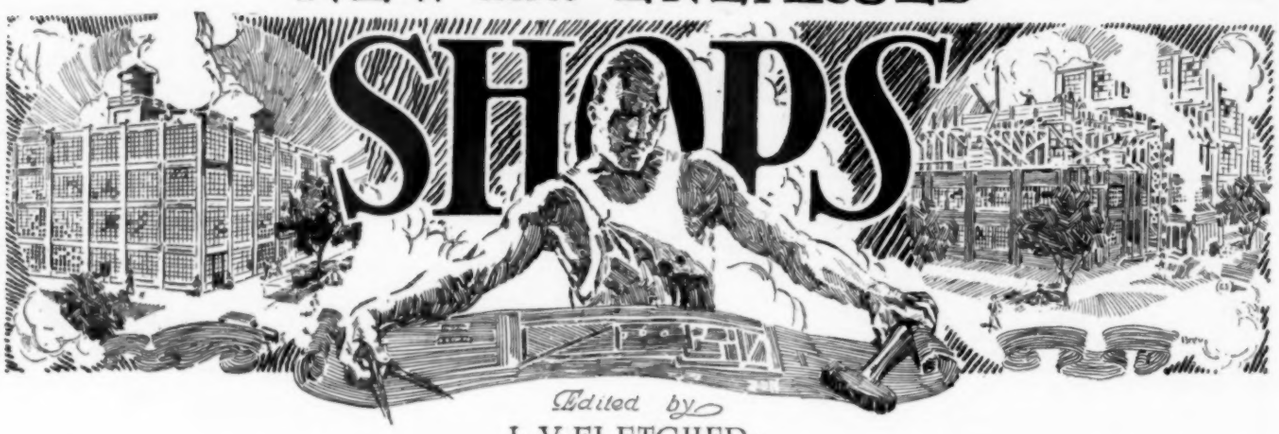
	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.49	$1.98	$1.66
5-gal. cans	2.00	1.74	2.23	1.86

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.00	16.50	11.25	11.50	15.00	13.00
25 and 50-lb. kegs	15.25	16.75	11.50	11.00	15.25	15.25
12½-lb. keg	15.50	17.00	11.75	15.25	15.50	13.50
5-lb. cans	17.00	18.50	15.00	13.00	17.00	15.00
1-lb. cans	18.00	19.50	16.00	13.00	18.00	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW *and* ENLARGED



Edited by
L·V·FLETCHER

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

Mass., Boston—The Meisel Press Mfg. Co., Dorchester Ave.—34-in. gear cutter.

D. C., Washington—Pay Master Genl. Bureau of Supplies, U. S. Navy—horizontal multiple spindle drilling machine for use at naval torpedo station at Alexandria, Va.; to be used in drilling air flaps and air flap heads.

N. J., Bayonne—The Babcock & Wilcox Co., East 3rd St.—angle iron bending rolls.

N. J., Newark—The Diamond Electric Specialty Co., 101 South Orange Ave.—bench presses.

N. J., Newark—The Electric Specialty Corp., 101 South Orange Ave.—5 bench presses (kickers).

N. J., New Durham—J. Maurer—one 55 B. Mattison lathe and 1 post borer.

N. Y., Geneva—The Geneva Automobile Co., 145 Castle St.—machine tools for light machinery and repair work.

Pa., Ashley—R. West, Manhattan St.—25 Spring Baird circular knitting machines and two 25 hp. motors.

Pa., Erie—The Saxer Mchy. Co., Commerce Bldg.—1½-in. automatic screw machine, 2-in. Cleveland automatic screw machine, 2-in. single or double spindle bolt cutter with quick releasing head.

Pa., Philadelphia—J. Blood & Bros., Trenton and Alleghany Sts.—vats and boilers.

Pa., Philadelphia—The Fairmount Traction Co., 865 North 28th St.—5 ton tractor.

Pa., Philadelphia—F. G. Mensing, 1713 Sanson St.—6½ x 24 in. lathes.

Pa., Pittsburgh—The Pennsylvania R.R., Lines West of Pittsburgh, Union Sta.—reamer, cutter and drill grinder for use in Scully, Pa., shops.

Ga., Atlanta—R. S. Armstrong & Bro., 676 Marietta St.—lathes, 18, 20 and 24-in. swing, 12 x 14-ft. bed; 16, 18, 20 and 24-in. shapers, 24 to 30-in. drill presses, No. 2 and 3 Universal miller, pipe threading machines up to 6-in.; 24 x 24-in. planers, 8-ft. bed. Combination punch and shear machine, capacity up to 1-in. (new or used).

Ga., Atlanta—The Jones Machinery Corp., 1311 Healey Bldg.—textile equipment. (new or used.)

Ga., Cogdell—J. M. Morse—shingle and lathe mill machinery, also a 75 to 100 hp. boiler.

Tenn., Chattanooga—The Lookout Boiler and Mfg. Co., 1514 Chestnut St.—18-24 in. shaper, 21 in. lathe, 5 ft. center with screw, quick change gears and taper attachment.

Tenn., Chattanooga—The Peerless Foundry & Machine Co., F. L. DeMarco, Pres.—36 in. band saws, an 8 in. jointer, 24 in. planer, 20 in. drill press, 13 in. swing x 8 ft. bed and 18 in. swing x 12 ft. bed, quick change lathes, double emery stand for 8 to 12 in. wheels, 1 power hacksaw. (used).

W. Va., Wheeling—The Ackerman Mfg. Co.—equipment for the manufacture of can making machinery.

Ill., Chicago—J. C. Deagan, Inc., Berteau and Revenswood Aves.—surface grinder with magnetic chuck and stroke of about 36-in. similar to Brown & Sharpe No. 2, but for heavier work.

Ill., Chicago—The Federal Mchy. Sales Co., 12 North Jefferson St.—several large straight side double crank presses. (new or used).

Ill., Chicago—The J. L. Sparks Brass Co., 1723 Carrol Ave.—a sprue cutter.

Ill., Chicago — The Stocker-Rumely Wachs Co., 119 North Jefferson St.—Horning presses suitable for ⅞ in. rivets.

Ill., Pullman—The Pullman Co.—three No. 2 surface grinders, with magnetic chucks.

Ill., Pullman—The Sherwin-Williams Co.—white lead keg making machinery, also machines to print on kegs.

Ind., Evansville—C. H. Longeman, 408 Parrett St.—machinery for the manufacture of mason jars and catsup bottle equipment tops.

Ind., Ft. Wayne—L. Rasteller & Sons, Nelson and Wall Sts.—lathes, miller, shapers, drill presses, grinder and other equipment for the manufacture and repair of machinery.

Ind., La Porte—The Daconturier Co., Ltd., P. O. Box 95—an 8 x 24-in. lathe.

Ind., Marion—The Marion Machine, Foundry and Supply Co.
One 12 x 26 in. Universal cutter and grinder.
One 20 in. x 4 ft. lathe with taper attachment.
One 16 or 18 in. x 36 in. lathe.
One No. 2 or 3 Universal milling machine.
One wet drill grinder.
One 24 in. back geared drill press.
One 24 in. Standard shaping machine.
One No. 4 or 5 plain milling machine.

Mich., Bay City—The Wilson Body Co., 26th and Farragut Sts.—Woodworking equipment.

Mich., Charlotte—The Charlotte Chair Co.—woodworking machinery.

Mich., Detroit—The Clayton Lampert Co., Beaubien St.—machinery for the manufacture of fenders and automobile body parts.

Mich., Detroit—Comr. Purchases and Supplies, Municipal Courts Bldg.—two 3½ ton gasoline cranes, 1 pipe cutting machine for 30 to 36 in. pipe, and one for 42 to 48 in. pipe.

Mich., Detroit—The H. M. Lane Co., 701 Owen Bldg.—blowers, rattlers, tumblers and crane.

Mich., Detroit—The Pharo Mfg. Co., 1336 Woodward Ave.—general machine shop equipment.

Mich., Flint—The Dort Motor Co., South and Mason Sts.—woodworking machinery and special machines for the manufacture of closed automobile bodies.

Mich., Howell—The Spencer Smith Machine Co.—machinery for finishing pistons for gasoline engines.

Mich., Lansing—The Federal Drop Forge Co.—forges, hammers and shears.

Mich., Lansing—The Novo Engine Co., 702 Porter St.—foundry and general machine shop equipment for casting and finishing engine parts.

Mich., Pontiac—The Detroit Weatherproof Body Co.—glass machinery, 1 roughter, 1 smoother, 1 polisher, 1 screach polisher and 1 edge grinder.

Mich., River Rouge—L. A. Filder, 3218 West Jefferson Ave.—woodworking machinery, 1 chain mortiser or hollow chisel, 1 veneer press, 1 band saw and 1 sander.

Mich., St. Clair—The Diamond Crystal Salt Co.—pumps and evaporators.

O., Akron—The Hardware and Supply Co., 21-29 West Market St.—one 8 x 24-in. motor driven surface grinder for wet grinding, current 220-volt, 3-phase, 60-cycle.

O., Canton—The Canton Art Metal Co., 920 Market Ave., S.—press similar to a No. 1 Toledo.

O., Cincinnati—The Cincinnati Cream Cabinet Co., 202 Main St.—a power brake and squaring shears, to have 16 gage capacity.

O., Cleveland—The Biggs Watterson Co., 1235 West 9th St.—crank shaft lathe to swing about 48 in. x 10 ft. between centers.

O., Cleveland—The Cleveland Natl. Machine Co., 1366 West 70th St.—arbor press.

O., Cleveland—The Cleveland Osborn Mfg. Co., Hamilton Ave. and East 54th St.—boring machines to be used for the manufacture of brushes.

O., Cleveland—The Cooperative Mfg. Co., 929 Society for Savings Bldg., (R. C. Hyre, Secy.)—complete woodworking equipment for the manufacture of piano benches.

O., Cleveland—The Empire Plow Co., 3140 East 65th St.—press similar to a No. 59 Toledo or No. 77½ Bliss.

O., Cleveland—The Federal Eng. and Machine Co., 203 St. Clair Ave., N. E.—Universal surface grinder.

O., Cleveland—The First Tool and Die Co.—No. 6 vertical milling machine.

O., Cleveland—The Steel Improvement and Forge Co., 5003 Windsor Ave.—8 steam forging hammers.

O., Cleveland—The Superior Tractor Co., 401 Erie Bldg.—drill heads.

O., Cleveland—The Virden Brass Co., Carnegie and East 63rd Sts.—spinning lathe.

O., Massillon—The Enterprise Aluminum Co.—one No. 4 spinning lathe to turn and head lids.

O., Salem—The W. H. Mullins Co., Depot St.—machine tools.

Wis., Milwaukee—The Autolife Tire Chain Co., 231 27th St.—machine shop equipment.

Wis., Milwaukee—C. Burlock, 297 3rd St.—rubberizing machinery.

Wis., Milwaukee—The Jambor Tool and Stamping Co., 911 Center St.—stamping presses.

Wis., Milwaukee—D. H. McCory—trimming presses.

Wis., Milwaukee—Scholz & Sons, 742 20th St.—2-in. automatic wood turning lathe.

Wis., Milwaukee—The Shope Brick Co., 831 M. & M. Bank Bldg.—machinery for the manufacture of cement brick.

Wis., Park Falls—The Park Falls Lumber Co.—54 x 54 in. x 10 or 12 ft. planing machine with two heads on rail (used).

Wis., Sheboygan—The Jenkins Machine Co., 315 North 8th St.—machine tools.

Wis., Sheboygan—The Porcelain Enameling Co. of America, Lake Shore Rd.—presses for use in enameling processes. (new or used.)

Wis., Stanley—The Stanley Toy Wks.—4 or 8-in. P. & G. ring lathe.

Wis., Sturgen—The Sturgen Bay Fruit Package Co.—band saw and wooden box making machinery.

Wis., Washburn—The Washburn Mfg. Co.—machinery for the manufacture of excelsior.

Mo., St. Louis—The Natl. Lead Co., 6500 Manchester St.—Bliss or Toledo blanking presses.

Mo., St. Louis—The Steinwender Stoffregen Coffee Co., 301 South Broadway—can making machinery.

Okla., Tulsa—W. C. Norris, Frisco & Frisco Ry.—No. 4 Warner or similar turret lathe, a sensitive drill press, a hand miller, a No. 25 W. & W. bulldozer, with reversing clutch, a 1½ in. Ajax forging machine.

Tex., Houston—The Grant Locomotive and Car Wks., Nance and Maffit Sts.—Fox brass lathe, a 20 or 22 in. x 8 ft. double back geared, quick change engine lathe with taper attachment, a 44 in. vertical boring mill with 2 heads, a heavy duty shaping machine, a link grinder, a lathe for engine bolts and taps (new or used).

Tex., Houston—The Krieter Machine Co., 205 San Jacinto St.—one 12-in. slotter, (used), one heavy duty turret lathe, motor driven, with 6-in. hole through spindle; one thread miller, to cut inside and outside taper threads 3 to 6-in. pipe threads.

Utah, Salt Lake City—The Salt Lake Stamp Co., 65 West Broadway—power punch presses similar to No. 19 Bliss and 3 or 4 smaller presses.

Wash., Seattle—The Western Paper Goods Co., Collins Bldg.—machinery for the manufacture of paper.

Ont., Guelph—The Gilson Mfg. Co., Ltd.—punches, shears and machinery for the manufacture of sheet metal. Address G. F. Koch, Purch. Agt.

Ont., Renfrew—The Renfrew Mchy. Co.—machinery for the manufacture of cream separators.

Ont., Toronto—The Hessco Electrical Mfg. Co., 33 Church St.—No. 69 N. Bliss press or equivalent. (used).

Ont., Windsor—The Burroughs Adding Machine Co., Ltd., McDougal Ave.—Stamping machine equipment.

Que., Montreal—The Canada Cement Co., Ltd., 273 Craig St., W.—152 in. squaring shear, a set of power drive forming rolls to take 30 in. sheet metal, a Horning press similar to a No. 266 B, a geared side seaming press, two No. 30 beading and flanging machines, a No. 6 double seamer, and a single back geared No. 108 Niagara power press. (new).

Metal Working

NEW ENGLAND STATES

Mass., Newton Upper Falls—The Saco Lowell Shops, 77 Franklin St., Boston, will soon award the contract for the construction of a 2 story, 200 x 350 ft. factory, for the manufacture of cotton machinery. Lockwood, Greene & Co., 60 Federal St., Boston, Engrs.

MIDDLE ATLANTIC STATES

N. J., Camden—Kruse & Slatery, 8th and Cherry Sts., Philadelphia, have awarded the contract for the construction of a 2 story, 50 x 100 ft. factory, here, for the manufacture of tools. Estimated cost, $24,000.

N. Y., Elmira—The Genl. Electric Co., Hulett Bldg., has awarded the contract for the construction of a 1 story, 110 x 560 ft. foundry. Estimated cost, $300,000.

N. Y., Geneva—The Geneva Automobile Co., 145 Castle St., plans to build a 2 story, 50 x 150 ft. garage. Estimated cost, between $40,000 and $50,000.

N. Y., New York—(Borough of Manhattan)—L. Dryer, 303 Greenwich St., is having plans prepared by G. McCabe, Archt., 96 5th Ave., for the construction of a 2 story, 50 x 100 ft. garage, at 217-19 West 18th St. Estimated cost, $30,000.

N. Y., Syracuse—The Brown, Lipe, Chapin Gear Co., Marcellus St., has awarded the contract for the consutruction of a 5 story, 70 x 297 ft. factory, for the manufacture of gears, on Ontario St. Estimated cost, $800,000.

Pa., Exeter (Pittston P. O.)—The Exeter Machine Wks. plan to build a 2 story, 50 x 150 ft. foundry. Estimated cost, $70,000.

Pa., Scranton—S. Hein, Pittston Ave., has awarded the contract for the construction of a 1 story, 40 x 400 ft. garage. Estimated cost, $42,000.

Pa., Wilkes-Barre—The J. Thomas Co., Stanton St., has awarded the contract for the construction of a 1 story, 60 x 150 ft. garage and factory. Estimated cost, $50,000.

MIDDLE WEST

Ill., Chicago—The Flexible Steel Lacing Co., 522 South Clinton St., is having plans prepared by W. G. Carnegie, Archt., 189 West Washington St., for the construction of a 1 story, 200 x 200 ft. factory, on Polk St., along the Belt Line R. R. Estimated cost, $200,000.

Ill., Chicago—The Lakeview Lithographing Co., 1256 Wellington St., plans to build a 1 story, 40 x 60 ft. factory on Barry and Ravenswood Aves. Estimated cost $8,000.

Ill., Chicago—The Republic Flow Meters Co., 565 West Washington Blvd., has awarded the contract for the construction of a 2 story, 75 x 125 ft. factory, at 2240 Diversey Parkway. Estimated cost, $85,000. Noted Sept. 11.

Ill., Chicago—The Tuthill Spring Co., 760 W. Polk St., has awarded the contract for the construction of a 1 and 2 story, 210 x 420 ft. factory, for the manufacture of automobile springs, on 31st St. and Kilbourne Ave. Estimated cost, $225,000.

Ind., Goshen—The Advance Casting Co. is building a 70 x 196 ft. factory, for the manufacture of gray iron castings. Estimated cost, $25,000. S. E. Schacht, 1700 Prairie Ave., Elkhart, Pres.

Mich., Bay City—The Wilson Body Co., 26th and Farragut Sts., is having plans prepared by Esselstyn, Murphy & Hanford, Archts. and Engrs., 810 Marquette Bldg., Detroit, for the construction of a 3 story, 250 x 350 ft. addition to its factory.

Mich., Detroit—I. Applebaum, 2023 Dime Bank Bldg., manufacturer of rails and railway metals, has awarded the contract for the construction of a 3 story, 76 x 180 ft. factory, on Russell St. Estimated cost, $100,000.

Mich., Detroit—The Gray Electric Co., 70 State St., has awarded the contract for the construction of a 2 story, 31 x 132 ft. factory, on Jones St. Estimated cost, $30,000.

Mich., Lansing—The Federal Drop Forge Co. has awarded the contract for the construction of a 1 story, 60 x 120 ft. factory.

Mich., Lansing—The Novo Engine Co., 702 Porter St., has awarded the contract for the construction of a 2 story, 120 x 200 ft. foundry and machine shop. Estimated cost, $250,000.

O., Cincinnati—The Cincinnati Planer Co., North St., is having plans prepared by Zettel & Rapp, Archts., Merchants Library Bldg., for the construction of a 2 story, 39 x 120 ft. addition to its plant.

O., Cleveland—The Auer Register Co., 403 Long Ave., will build a 2 story, 75 x 100 ft. factory, on Payne Ave. and East 37th St. Estimated cost, $100,000. W. S. Ferguson Co., 1900 Euclid Ave., Archt.

O., Cleveland—The Buckeye Brass Co., 6410 Hawthorne Ave., is having plans prepared by A. Sogg, Archt., 319 Hippodrome Bldg., for the construction of a 1 story, 30 x 110 ft. and 75 x 75 ft. foundry and furnace room, on Ashland Rd. Estimated cost, $50,000.

O., Cleveland—The Chandler Price Co., 6000 Carnegie Ave., manufacturer of printing presses, has awarded the contract for the construction of a 4 story, 26 x 44 ft. addition to its foundry. Estimated cost, $10,000.

O., Cleveland—The Creswell Realty Co., Union Bldg., is having revised plans prepared by W. S. Ferguson Co., Engrs. and Archts., 1900 Euclid Ave., for the construction of an 8 story, 100 x 125 ft. garage, on Huron Rd. and East 12th St. Estimated cost, $500,000.

O., Cleveland—The Duesenberg Motor & Auto Corp., c/o L. M. Rankin, Highlander Motor Corp., Kansas City, Mo., plans to build a 1 story, 300 x 350 ft. auto plant along the tracks of the Nickel Plate R.R. and East 152nd St. Estimated cost, $500,000.

O., Cleveland—The Natl. Bronze and Aluminum Foundry Co., East 79th St., is having plans prepared by J. Schmehler, Archt., for the construction of a 1 story, 50 x 150 ft. foundry, on East 88th St. and Kinsman Rd. Estimated cost, $60,000.

O., Cleveland—The Redding Steel Products Co., 1519 East 32nd St., has awarded the contract for the construction of a 1 story, 62 x 80 ft. machine shop, at 7628 Quincy Ave. Estimated cost, $15,000.

O., Columbus—The Althoff Plating and Polishing Co., 324 North 6th St., will build a 2 story, 40 x 100 ft. factory, at 212 North Grant Ave. Estimated cost, $15,000. R. Sims, Grand Theatre Bldg., Archt.

O., Columbus—O. G. Roberts, 177 North 4th St., has awarded the contract for the construction of a 1 story, 37 x 120 ft. salesroom and garage, at 594 East Long St. Estimated cost, $55,000.

O., Dayton—The M. M. Smith Realty Co., 703 Conover Bldg., has awarded the contract for the construction of a 2 story, 60 x 150 ft. garage, on West 3rd St. Estimated cost, $60,000.

O., Marietta—The Safe Cabinet Co. has awarded the contract for the construction of a plant, to include 6 factory buildings of various sizes. Estimated cost, $8,000,000.

Wis., Menomonee Falls—The Schumann Motor Co. will soon award the contract for the construction of a 1 story, 75 x 150 ft. garage and repair shop. Estimated cost, $50,000. Herbst & Kuenzli, Caswell Bldg., Milwaukee, Archts.

Wis., Milwaukee—The Dunning Heating Supply Co., 223 Reed St., equipment for new factory.

Wis., Saukville—The Ozaukee Heater Co. is having plans prepared by W. F. Hilgin, Archt., Columbia St., Cedarburg, for the construction of a 1 story, 36 x 100 ft. foundry. Estimated cost, $50,000. H. Cary, Pres.

Wis., Waukesha—J. H. Wolf, 110 East Main St., is having plans prepared for the construction of a 1 story, 50 x 150 ft. garage and repair shop. Estimated cost, $25,000.

WEST OF THE MISSISSIPPI

Mo., Bethany—C. Hacker & Sons is having plans prepared by R. and E. R. Meier, Lincoln Bldg., St. Joseph, for the construction of a 2 story, 82 x 100 ft. garage. Estimated cost, $60,000.

Tex., Houston—The Southern Motors Mfg. Association, Beatty Bldg., has had plans prepared by D. G. W. Smith, Engr., Beatty Bldg., for the construction of a 1 story, 300 x 500 ft. factory, near here. Estimated cost, $290,000.

CANADA

Ont., Brantford—The Dominion Steel Products Co., plans to build a 1 story, 80 x 100 ft. foundry. Estimated cost, $150,000.

Ont., London—Bd. Educ. is having plans prepared by L. V. Carrothers, Archt., Hydro Offices, for the construction of two, 3 story, 100 x 185 ft. schools, to include a manual training department. Estimated cost, $275,000.

Ont., Strathroy—The Andrews Wire Co., plans to build a 2 story, 60 x 125 ft. factory. Estimated cost, $50,000.

Ont., Windsor—The Burroughs Adding Machine Co., Ltd., McDougal Ave., has awarded the contract for the construction of a 3 story factory and office. Estimated cost, $300,000.

General Manufacturing

NEW ENGLAND STATES

Conn., Bridgeport—Salts Textile Mfg. Co. will soon award the contract for the construction of a 1 story, 100 x 340 ft. factory. Estimated cost, $250,000. Ballinger & Perrott, 47 West 34th St., New York City. Archts. and Engrs.

Mass., Holyoke—The American Braiding Co., 193 High St., has awarded the contract for the construction of a 6 story, 103 x 105 ft. factory, on Race and Appleton Sts. Estimated cost, $225,000.

MIDDLE ATLANTIC STATES

N. J., Hoboken—H. R. Mallison, Woolsley Ave., Long Island City, has awarded the contract for the construction of a factory, here, for the manufacture of silk. Estimated cost, $200,000. Noted Jan. 15.

N. J., South River—The South River Spinning Co. has awarded the contract for the construction of a 1 story, 60 x 95 ft. factory. Estimated cost, $25,000.

N. Y., New York (Borough of Bronx)—The Standard Lithographing Co., 1100 Brook Ave., will build a 6 story, 50 x 118 ft. factory, on Brook Ave. and 167th St. Estimated cost, $75,000. O. J. Schwartzler Pres.

N. Y., New York (Borough of Brooklyn)—Echrupski & Masulovitch, c/o L. Allmendinger, Archt., 20 Palmetto St., will build a 3 story, 55 x 75 ft. bakery, on South 2nd St. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—The Todd Shipyards Inc., Van Brunt and Beard Sts., have awarded the contract for the construction of a 1 story, 80 x 125 ft. shop, on Henry and Bryant Sts. Estimated cost, $40,000.

N. Y., New York (Borough of Queens)—Loft Inc., 400 Broome St., New York City, manufacturer of candy, will build an 8 story, 35 x 100 ft. factory, on Vernon Ave., Long Island City.

N. Y., New York (Borough of Queens)—The Metropolitan Life Insurance Co., 1 Madison Ave., New York City, has awarded the contract for the construction of a 5 story, 50 x 400 ft. printing building on Court St. and Thompson Ave., Long Island City.

N. Y., New York (Borough of Queens)—L. Mundet & Sons, 59 Pearl St., New York City, will build a 4 story, 200 x 200 ft. factory, on King and Ferris Sts., Ridgewood. Estimated cost $400,000.

N. Y., Rochester—The Ritter Dental Co., 404 Main St., will build a 1 story addition to its factory. Estimated cost, $15,000.

N. Y., Rochester—The Yawman & Erbe Mfg. Co., Campbell St., will soon award the contract for the construction of a 3 story, 121 x 253 ft. factory, for the manufacture of furniture.

Pa., Pittston—The T. W. Bentley Silk Co. has awarded the contract for the construction of a 3 story, 72 x 110 ft. silk mill on Main St. Estimated cost, $75,000.

Pa., Philadelphia—J. Blood & Bros., Trenton and Alleghany Sts., are having plans prepared by Clark & Dudnick, Archts., Drexel Bldg., for the construction of a 3 story factory, on Janney and Clearfield Sts., to be used as a dye works. Estimated cost, $60,000.

Pa., Philadelphia—T. Potter Son Co., Inc., 2nd and Erie Sts., has awarded the contract for the construction of a 3 story 48 x 91 ft. factory, for the manufacture of oil cloth. Estimated cost, $40,000.

Pa., Scranton—The Standard Throwing Co. has awarded the contract for the construction of a 2 story, 60 x 150 ft. silk mill, on Race and Brown Sts. Estimated cost, $40,000.

MIDDLE WEST

Ill., Chicago—The Agar Provision Co., 810 North Green St., has awarded the contract for the construction of a 4 story, 125 x 190 ft. sausage factory, on Fulton and Green Sts. Estimated cost, $400,000. Noted Aug. 28.

Ill., Chicago—The Columbian Colortype Co., 2141 Calumet Ave., is having plans prepared by A. S. Alschuler, Archt., 28 East Jackson St., for the construction of a 7 story, 120 x 175 ft. printing plant, on 21st St. and Calumet Ave. Estimated cost, $650,000.

Ill., Chicago—The W. Davies Co., Ltd., 4101 South Union Ave., has awarded the contract for the construction of a 6 story, 100 x 130 ft. meat canning plant, on Union Ave. and 41st St. Estimated cost, $300,000.

Mich., Detroit—The Detroit Belt Lacer Co., 27th and A St., is having plans prepared by L. Scisorek, Archt., 225 Farwell Bldg., for the construction of a 2 story, 60 x 100 ft. factory, on A St. Estimated cost, $35,000.

Mich., Detroit—The Pharo Mfg. Co., 1336 Woodward Ave., manufacturer of truck accessories, plans to build a 1 story, 60 x 150 ft. factory, a 2 story, 36 x 60 ft. office building and an 18 x 22 ft. boiler house. Estimated cost, $30 000. Brown & Preston, 406 Empire Bldg., Archt.

O., Cleveland—The Apollo Tire and Rubber Co., C. A. C. Bldg., has awarded the contract for the construction of a 1 story, 80 x 128 ft. addition to its factory, at 3962 East 93rd St. Estimated cost, $15,000.

O., Cleveland—Cleveland Window Glass Co., 209 Champlain Ave., will construct a 1 story, 50 x 72 ft. mill building, at 2421 Elm St. Estimated cost, $10,000.

WEST OF THE MISSISSIPPI

Mo., St. Louis—The Whistle Co., Inc., 2918 Locust St., has awarded the contract for the construction of a 2 story, 24 x 58 ft. factory, for the manufacture of soft drinks. Estimated cost, $40,000.

Tex., Houston—W. H. Irvin, Hemphill and Railroad Sts., has awarded the contract for the construction of a 4 story, 42 x 84 ft. ice plant and ice cream factory. Estimated cost, $46,000.

WESTERN STATES

Ariz., Phoenix—C. D. Davis, c/o Lescher & Kibbey, Archts., Bank of Arizona Bldg., is having plans prepared for the construction of a 2 story, 75 x 137 ft. bakery, on 3rd Ave. Estimated cost, $50,000.

Cal., Long Beach—The California Cotton Products Co., First Natl. Bank Bldg., plans to build a cotton mill, on Obispo and Anaheim Sts. Estimated cost, $75,000. R. G. Swaffield, Secy.

Cal., Santa Ana—The Holly Sugar Co. has awarded the contract for the construction of a 2 story, 60 x 100 ft. factory. Estimated cost, $70,000.

Wash., Bellingham — The Whatcom Co. Dairymen's Association plans to build a 2 story factory, for the manufacture of cheese, butter, powdered skim milk and ice cream. Estimated cost, $300,000.

Wash., Seattle—The Western Paper Goods Co., Collins Bldg., has awarded the contract for the construction of a 1 story, 90 x 103 ft. factory, at 1401 Dexter Ave. Estimated cost, $15,000.

CANADA

Ont., Ottawa—The Dominion Government will build an addition to the building occupied by the Printing Bureau, on St. Patrick St. Estimated cost, $25,000. R. C. Wright, Dept. Pub. Wks., Archt.

Ont., Sudbury—Imperial Oil Co., Ltd., Imperial Oil Bldg., Toronto, plans to build a 2 or 3 story warehouse and distributing station. Estimated cost, $200,000.

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